FINAL REPORT

GRAND AVENUE NORTHWEST CORRIDOR STUDY

SR 303L to SR 101L

MARICOPA ASSOCIATION of GOVERNMENTS

January 2003

Grand Avenue
Northwest Corridor Study
SR 303L to SR 101L

Final Report

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Prepared for

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EXECUTIVE SUMMARY

The Grand Avenue Northwest Corridor Study encompasses an 11.5-mile segment on US 60 (Grand Avenue) between SR 303L and SR 101L. This roadway passes through the cities of Surprise and Peoria, towns of El Mirage and Youngtown, and the unincorporated communities of Sun City West and Sun City. This roadway is one of the primary urban arterials serving these communities and is also a vital link in the statewide highway system. This portion of US 60 serves primarily as the continuation of US 93, which links the Phoenix metropolitan area to Las Vegas, Nevada, and I-15. US 93 terminates in Wickenburg approximately 20 miles northwest of the study corridor.

The purpose of this study is to determine the long-term needs of the highway corridor and to establish a plan for meeting these needs. Consideration was given to transit, pedestrians, bicyclists, electric carts, and special needs of the elderly and physically challenged as well as to highway needs. Eight working papers were prepared during the study and were posted on the Maricopa Association of Governments (MAG) web site for review by stakeholders and the general public.

Several agency/community forums were held to bring together the primary stakeholders in the corridor. These forums were held six times during the course of the study to review study products and to provide input to the corridor needs identification and to the selection of preferred solutions. Representatives attended the forums from all the communities identified above, plus the Regional Public Transportation Authority (RPTA), Arizona Department of Transportation (ADOT), Maricopa County Department of Transportation (MCDOT), Federal Highway Administration (FHWA), Burlington Northern Santa Fe Railroad Company (BNSF), and other cities and towns in the MAG Region. The unincorporated communities were represented by their respective homeowner associations. Two public meetings were held and were well attended. Separate meetings were held with some of the stakeholder groups upon request including Sun City West Property Owners and Residents Association, Sun City Home Owners Association, Sun City Grand Coalition, SunHealth Systems, and development interests.

HISTORY

US 60 historically served as the primary route between the Phoenix and Los Angeles areas. This function was moved to I-10 when it was completed in the late 1980's. In the meantime, extraordinary growth occurred in the study area beginning with the original Del Webb Sun City in the early 1960's. Subsequently, Sun City West was built and more recently the City of Surprise has become one of the fastest growing communities in the Greater Phoenix Area due in part to the development of Sun City Grand within the city limits. Most of these large development communities cater primarily to adult/senior citizens; however, more recent developments are designed for the broader population. The large development communities have

generally been designed to limit arterial traffic passing through the development. As a result, the arterial grid in the area is very limited which forces more traffic and multiple functions on the two through arterials – Grand Avenue and Bell Road. Both streets serve through traffic, community arterial traffic, and access to abutting commercial land uses. Consequently, the roadways do not provide good service to any one of these functions.

In the mid-1980's, ADOT conducted a study of Grand Avenue from what is now SR 303L to Van Buren Street near Downtown Phoenix. The study recommended construction of a grade-separated expressway for the entire 26-mile distance. Subsequently, a connection between Grand Avenue and I-17 where the two roads cross was deemed to be not possible. In 1994, the planned Paradise Freeway, which would have provided a linkage from Grand Avenue to I-17 and to SR 51, was removed from the planned highway system. This action eliminated any potential direct linkage between the planned Grand Avenue Expressway and other freeways/expressways in the central portion of the urban area.

In 1998, a new corridor study of Grand Avenue was completed by MAG. Again, the entire 26-mile section was considered, but it was determined that the primary focus should be on the portion southeast of SR 101L where the six-legged intersections exist and train activity on the railroad creates more conflicts with highway traffic. Based on local community input, no recommendations were made in that study for the northwest portion of Grand Avenue.

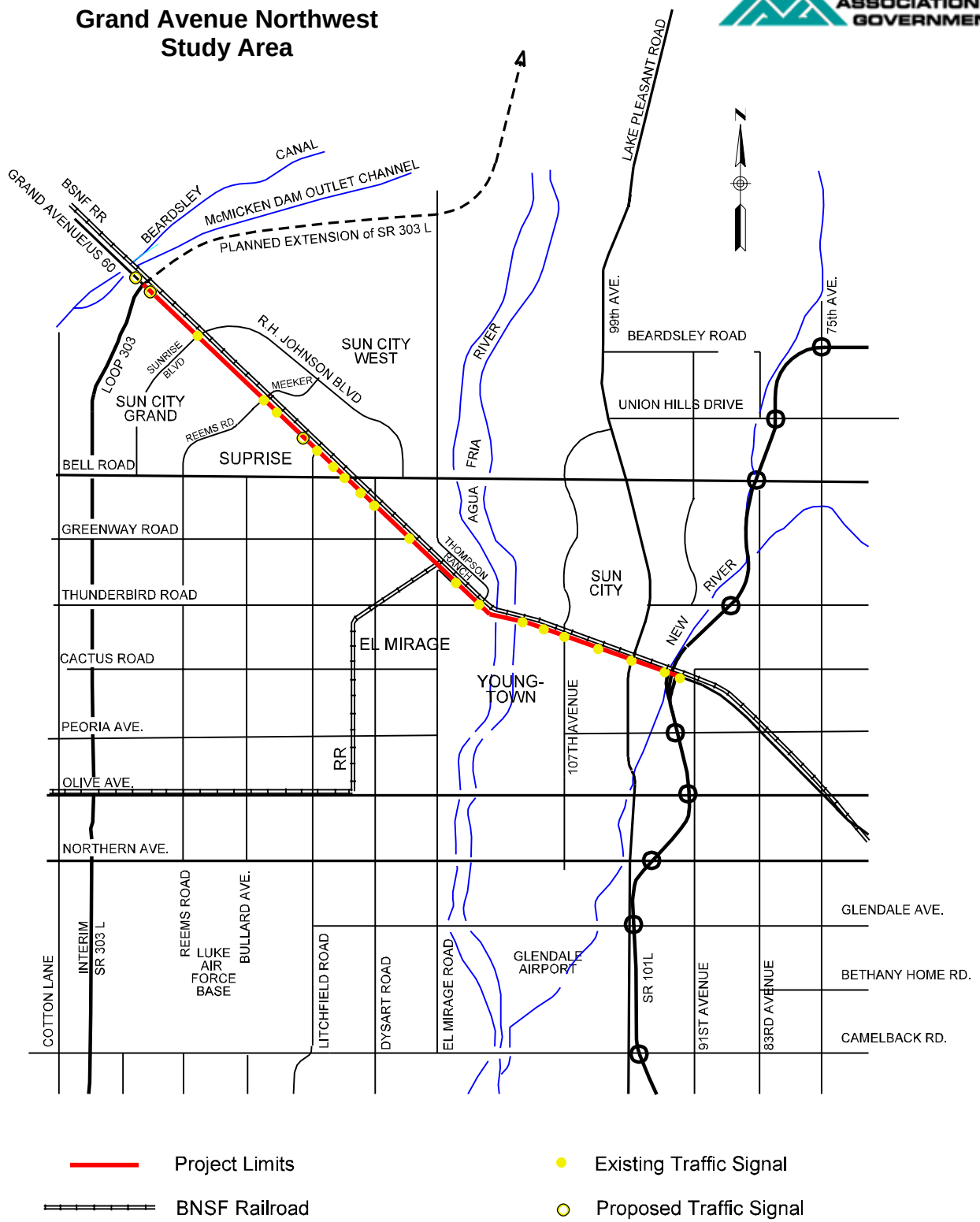
The MAG Corridor Study was followed by a Major Investment Study conducted by ADOT for the portion of Grand Avenue between SR 101L and I-17. The results of this study were the selection of eight grade separation projects to eliminate the six-legged intersections and to provide additional grade separations with the BNSF. Two of these grade separations are under construction, two are programmed for construction in 2003, and four are in the final engineering design phase. All eight are programmed to be completed in 2006.

Although some additional improvements may be made to Grand Avenue between SR 101L and I-17, the roadway will probably have a capacity of approximately 50,000 vehicles per day (vpd), have some traffic signals, and appear to function more as a street than a freeway. This conclusion has an influence on the likely results of the Grand Avenue Northwest section.

EXISTING CONDITIONS

The general corridor area and project limits are illustrated in Exhibit ES.1. Grand Avenue is primarily a four-lane divided roadway with a short section of six-lane roadway near 103rd and 99th avenues. Between the Agua Fria River and the New River through Sun City, Grand Avenue has a raised curbed landscaped median. West of the Agua Fria River, Grand Avenue has an open swell median and paved outside shoulders. The right-of-way varies between 105 and 215 feet, and the roadway is not always in the center of the right-of-way.

Exhibit ES.1
Grand Avenue Northwest
Study Area



There are 18 signalized intersections and three more planned in the 11.5-mile length between SR 303L and SR 101L (average is one every 0.6 miles). In addition, there are nine additional unsignalized intersections. The BNSF parallels Grand Avenue on the northeast side. All cross streets cross the railroad at grade. There is a high degree of access control along Grand Avenue due to the railroad, a frontage road in El Mirage, and the way most of the development has been designed. There are commercial driveways along Grand Avenue in Sun City and north of Bell Road. The roadway functions as a high-type arterial due to the access control and the use of paved shoulders without curbs in most areas.

The existing typical weekday traffic volumes range from 14,000 vpd near SR 303L up to 37,400 vpd at 107th Avenue. Over the past two decades, traffic volumes have not grown dramatically due to diversions of traffic to I-10, SR 74 and the interim SR 303L. However, more recently, volumes have begun to increase more rapidly due to the development and the completion of SR 101L in the fall of 2000.

Overall, the accident rate along Grand Avenue is low compared to urban arterials; however, the fatality rate is higher than average due to the mix of through and local urban traffic.

Grand Avenue from Bell Road southeastward is designed as a SMART corridor in the MAG ITS Strategic Plan and will receive installation of intelligent transportation systems (ITS) systems including signal intertie, traffic detection, cameras, variable message signs, and linkage to a traffic operations center.

The only sidewalks along Grand Avenue are limited to a few commercial frontage areas. Due to the wide combined highway/railroad corridor, pedestrians do not frequently cross Grand Avenue. Bicycles are permitted on Grand Avenue, but there are no signs or pavement markings designating bicycle usage.

The local bus system is limited to Route 106 which ends at Boswell Hospital and extends into Phoenix via Peoria Avenue. Phoenix-Las Vegas intercity buses stop in Youngtown. There are three dial-a-ride systems that cover most of the corridor area.

BNSF operates a single branch line adjacent to Grand Avenue and an automobile intermodal yard in El Mirage. Trains usually pass through the area traveling at approximately 40 mph. A spur track crosses Grand Avenue in El Mirage and serves several customers south of the corridor.

POPULATION AND EMPLOYMENT FORECASTS

For the purposes of estimating future traffic, a study area was identified bounded by SR 74 on the north, 67th Avenue on the east, Northern Avenue on the south, and Rooks Road on the west. MAG has adopted growth forecasts that were prepared in 1997. The rate of growth in the area

and the changes in the general plans of some of the communities indicated that some updating of these forecasts was needed and was accomplished as part of this study. Working with MAG staff and the local communities, alternative growth forecasts were developed which indicated that by 2025, the growth in the study area may be approximately 90,000 more than is in the currently adopted forecasts. A comparison of the estimated 2000, MAG adopted, and the revised forecasts developed for this study are summarized below.

Comparison of Socioeconomic Projections
Grand Avenue Northwest Corridor Area of Influence

Projections	Population	Employment
2000 MAG Adopted	223,000	45,000
2025 MAG Design	437,000	120,000
2025 Alternative Higher Growth	526,000	167,000

Both 2025 forecasts were input into the MAG regional travel-forecasting model and used as a basis for determining needs and evaluating potential improvements in the corridor. An update of the adopted MAG forecasts is expected later in 2003.

ENVIRONMENTAL ISSUES AND TITLE VI/ENVIRONMENTAL JUSTICE

A brief environmental overview was made of the corridor to determine if there are any "fatal flaw" issues. None were found. The corridor does have a high percentage of populations that are protected under Title VI. Further evaluation will be required if the design of any improvements will directly impact employment or residential areas.

KEY ISSUES OF THE CORRIDOR STUDY

Based upon input from the agency/community forum and first public meeting, the following key issues were identified for the corridor:

- Improve crossings of Grand Avenue and the railroad.
- Improve emergency vehicle access within the corridor.
- Improve traffic operations at intersections.
- Expedite travel along Grand Avenue.
- Minimize environmental impacts including noise, visual and air pollution.
- Improve aesthetics of the corridor.
- Identify opportunities to enhance street network continuity to improve regional mobility.
- Maintain and enhance system continuity on Grand.

- Improve safety within the corridor.
- Address access control policies for Grand Avenue.
- Enhance elderly mobility.
- Enhance alternative mode travel within the corridor.
- Develop strategies that seek to improve both rail and vehicular traffic within the corridor.

LONG-TERM ROADWAY NEEDS

Transportation needs were identified through consultation with the public and agency stakeholders as well as through analyses and field review by the project team.

Traffic forecasts indicate that by 2010 the typical weekday traffic volumes will range from 25,900 vpd on the west end to 44,900 vpd on the east end. By 2025, the daily volumes are forecast to range between 40,800 and 57,100 vpd. Without improvements to Grand Avenue, all the major intersections are expected to be heavily congested by 2025. Widening Grand Avenue to six lanes and adding some turn lanes at intersections will enable most of the intersections to operate satisfactorily at Level of Service D in the peak hours.

There is interest from the communities to provide grade separations with the railroad to serve the two major hospitals in the area. This desire is based upon concern that the presence of a train on the tracks could delay getting to the hospitals in emergency situations. To date there are no documented cases of loss of life or other consequences caused by train delays.

There is also concern about the safety and appearance of the drainage channel along the south side of Grand Avenue east of Bell Road. The absence of landscaping and lighting along the roadway are also considered needs in the corridor.

Signal timing and the absence of modern traffic control and ITS is also a concern.

The absence of continuous arterial streets in the general study area is a major long-term concern. Grand Avenue and Bell Road carry most of the arterial traffic and cannot be expected to absorb the additional traffic volumes created by more development in the area.

ALTERNATIVE MODES NEEDS

Issues related to transit, pedestrians, bicyclists, and electric carts were identified through input from the public and stakeholders, through research provided in prior studies, and through field review. Transit service in the area is currently limited to separate dial-a-ride systems operated in each community. The metropolitan bus service has very limited service in the area because there is no funding provided by the local communities for this service.

The principal need is to develop a transit funding source that ideally would span throughout the corridor to provide coordinated transit service. Bus stops and park-and-ride lots will be needed to support the expanded system.

There are no provisions for pedestrians along Grand Avenue except in front of some commercial areas. Crossing Grand Avenue and the railroad is also very difficult due to the distance and the absence of designated walkways with smooth walking surfaces. Throughout the area, there are limited pathways between communities, and no provisions have been made to link the communities to the planned recreation/non-motorized travel routes along the rivers as presented in the MAG West Valley Multi-Modal Transportation Plan and the Flood Control District of Maricopa County Agua Fria Watercourse Master Plan. Walkways are narrow and generally lack shade.

There are no separate bicycle facilities along Grand Avenue or in the corridor area. There are no plans to link the communities to the planned recreation/non-motorized travel routes along the rivers. Railroad crossings are rough and not designed for bicyclists.

Electric carts are used within communities, but there are no provisions for travel between the communities. Standards for and application of signage and markings for cart travel are inconsistent and unevenly applied.

OPTIONS FOR IMPROVEMENTS IN THE CORRIDOR

Over 60 optional actions were identified and evaluated. These options covered a wide range of possibilities for roadway improvements as well as transit, pedestrian, bicyclists, and electric cart. The full list of options is included in Chapter 8 of the Final Report.

The first decision that was made was the type of basic roadway improvements for Grand Avenue. Three basic alternatives were identified and evaluated. The No-Build option and the Full Expressway option were not recommended for the following reasons:

- **No Build Option**: Traffic congestion will get increasingly worse, and the accident rate will continue to be high. The communities clearly want improvements to be made.
- **Fully-Controlled Access Expressway**: This option would entail removal of most traffic signals along Grand Avenue, construction of grade-separated interchanges at the major intersections and obtaining full access control. This option would require the removal of numerous business, extensive traffic rerouting, very high cost, higher traffic volumes and traffic speeds on Grand Avenue. This option was not favored by the communities and public and is not currently able to be funded. It was dropped from further consideration.

Some of the other specific actions that were identified and evaluated included grade separations at most of the individual intersections, grade separation with the railroad spur, removal of selected traffic signals, elimination of existing median breaks for left turns, and improvements to the railroad crossings.

Transit options considered included commuter rail, light rail, express bus, local bus, dial-a-ride, and park-and-ride lots. Other options included providing a pedestrian and bicycle path along Grand Avenue, improved pedestrian movement across the railroad and Grand Avenue, support for the regional non-motorized recreation and multi-modal transportation corridors, signage for the elderly, more pedestrian friendly walkways, and better provisions for electric cart travel.

These options were evaluated and from them, a set of recommendations was selected.

RECOMMENDATIONS

Grand Avenue has 18 existing traffic signals, and three more are planned, within the 11.5-mile section between SR 303L and SR 101L. Although it has a higher degree of access control than a typical arterial street, there are still many commercial driveways that provide business access along the corridor. Some stakeholders wish to maintain the future option of upgrading Grand Avenue to a fully access controlled expressway, to serve regional traffic needs. To accomplish this improvement would require elimination or substantial modifications to most existing commercial property with access to Grand, elimination of many traffic signals, removal of some homes and businesses along cross streets to construct grade separations, and other substantial improvements. In addition, pedestrians, bicycles, and local transit are typically prohibited on fully access controlled roadways. Given these impacts, particularly the loss of local access, other stakeholders are not in favor of upgrading this section of Grand Avenue to an expressway. Accordingly, the recommendations presented below were developed to address both regional traffic needs as well as local access. These two functions together determine the ultimate concept for this section of Grand Avenue as described below.

Grand Avenue is and will continue to be an enhanced arterial/limited expressway. It is a regional road that serves through traffic and arterial traffic. Most if not all traffic signals will remain, and the roadway will continue to have a higher degree of access control than typical arterials. The emphasis for Grand Avenue is the movement of motorized vehicles and, therefore, not on pedestrians, bicycles, or local transit if it hinders traffic flow.

The following recommendations were presented at an agency/community forum and at a public meeting. A questionnaire was given to all the attendees, and they were asked to rate their degree of support. All but one of the recommendations received support, and some of them received strong support. The second recommendation under Bicycle Improvements failed to receive overall support, as some people were concerned about the safety of bicyclists using the Grand Avenue shoulders under the "Share the Road" concept. ADOT cannot prohibit bicycle use of Grand Avenue, and there is insufficient right-of-way for a continuous, separate bicycle path. A

recommendation was added to explore providing a bicycle path in the BNSF right-of-way. Additionally, two recommendations under "Basic Highway Features" were added in response to feedback from local agency representatives. The two additions address right-turn lanes and median openings.

Funding for these projects is expected to be a mix of private, local, regional, state, and federal sources. One potential funding source is a possible extension of the half-cent sales tax. Although the existing tax is limited to the construction of new freeways, the extension is expected to allow sales tax funds to be applied to a wider variety of highway improvements. A decision on funding allocations is expected to be made by the Regional Council following the MAG Regional Transportation Plan (RTP) process, which is expected to be completed in 2003. Implementation of the recommendations presented below is contingent upon their consistency with and, as appropriate, their incorporation into the MAG RTP. Additional recommendations for Grand Avenue may be made as part of the MAG Northwest Transportation Study currently under way that will provide input to the MAG RTP process.

Basic Highway Features for Grand Avenue:

- Six lanes.
- Add turn lanes at intersections.
- ITS including signal coordination and traffic monitoring.
- Signal timing study.
- Evaluate railroad crossings for safety and Americans with Disabilities Act compliance.
- Landscaping.
- Street lighting.
- Prepare implementation plan for signage designed for elderly drivers based upon state and national research and coordinated with local jurisdictions.
- Place guardrail or barrier along drainage channel that is adjacent to travel lanes on Grand Avenue.
- Support construction of SR 303L and the arterial grid to divert traffic from Grand Avenue.
- [*]Add right-turn lanes to commercial areas where feasible.
- *Close median openings at non-signalized locations where feasible.

[*]Added in response to local agency feedback during consultation on the initial draft recommendations.

Transit Improvements:

- Encourage creation of a regional funding source, enabling implementation of a multi-jurisdictional transit system in the Northwest Valley.
- Develop an integrated Dial-A-Ride system covering Northwest Valley communities.
- Extend metropolitan transit system along arterials in corridor area in accordance with a master plan for bus service to be developed at a future date.
- Develop Park-and-Ride lots in accordance with MAG plan.
- If express bus service is extended into the corridor area, express buses can operate on Grand Avenue in mixed use travel lanes.
- Study innovative approaches to serving seniors and persons with disabilities.
- Monitor the MAG High Capacity Transit Study and the RPTA Regional Transit Study and their potential implications on the corridor area.
- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering transit needs.
- Bus stops on Grand should be restricted to locations with safe pedestrian access to and from adjacent communities. Stops should have bus bays where feasible and connect to pedestrian walkways from adjacent neighborhoods.

Pedestrian Improvements:

- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering pedestrian needs.
- If new grade separations are constructed along Grand Avenue, pedestrian travel across Grand should be considered in the design of the grade separations.
- All new street improvements should meet ADA requirements for pedestrian travel.
- Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.
- Within cities and neighborhoods away from Grand Avenue, local governments should look for ways to enhance pedestrian travel such as reducing length of crosswalks, separating sidewalks from the street curb, and providing shade for walkways.
- Local governments should revise land development standards to enhance pedestrian movements within activity centers.

Bicycle Improvements:

- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering bicycle needs.
- Bicycle movements along Grand Avenue may be accommodated on shoulders or wider outside travel lanes through the shared roadway concept in accordance with ADOT Policy MGT 02-1 dated March 1, 2002.
- *Explore options with BNSF to provide a bicycle path within their right-of-way.
- If new grade separations are constructed along Grand Avenue, bicycle travel across Grand should be considered in the design of the grade separations.
- Encourage the development of the West Valley non-motorized transportation and recreation corridor.
- Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. Locations other than Grand Avenue should be emphasized.

Electric Cart Improvements:

- Consider the needs of cart travel in the design of new routes and grade separations.
- Local governments should conduct a follow-up specific study to develop recommendations for signage, lane markings, and site development standards to accommodate cart needs.
- Continue to limit golf carts to lower speed streets to minimize safety issues. Evaluate limiting carts to streets with speed limits less than 35 mph (current law permits carts on streets up to 35 mph).

Potential Grade Separations:

The following potential grade separations or interchanges have merit but need more detailed engineering, cost analyses, and impact assessment before a final decision is made to proceed. If constructed, each one would be expected to require the removal of existing businesses and in some cases residential units. The design of all grade separations should consider alternative mode needs. Some traffic signals and access points along Grand Avenue that were placed to serve retail centers may have to be removed.

*Added in response to local agency feedback during consultation on the initial draft recommendations.

- Extension of El Mirage Road to Olive, with a grade separation interchange at Grand Avenue. Several potential locations may be considered. This proposed roadway would be part of the city/county road system.
- Meeker/Reems grade separation interchange or emergency access grade separation. This facility would primarily benefit local community travel so local funding participation would be expected. There is high interest in this issue so that a study to select the best solution should be conducted soon.
- 103rd Avenue grade separation. This facility would provide a linkage between north and south Sun City for motorized and non-motorized travel. It would almost exclusively benefit local community travel so local funding would be expected.

PRIORITIES

Action elements of the recommendations are grouped into three priority categories as described below.

Priority One

The most important element of the recommendations for the Grand Avenue Northwest Corridor is to construct Grand Avenue as a six-lane roadway with a raised median. The proposed roadway cross section includes 10-foot outside shoulders where right-of-way is available. These shoulders would be available for use by bicyclists. To accomplish this action, ADOT will need to proceed with a Design Concept Report (DCR) and environmental documentation. Through this process, a signal timing study and railroad crossing evaluation can be conducted to determine what elements would be included in the overall design concept. In addition, the specific plans for the ITS Smart Corridor can be incorporated into the overall action plan and phasing plan for Grand Avenue. Through the DCR process, the determination of the intersection improvements will be made with consideration for non-motorized travelers and transit as appropriate. Similarly, the basic agreements between ADOT and local governments will be developed regarding landscaping and lighting. The concepts for providing a barrier along the drainage channel should also be incorporated. Final design and construction of these improvements will be dependent on identification of a funding source, programming the actions into the improvement program, and scheduling the implementation.

Studies should be conducted to determine the most appropriate action to provide emergency vehicle service across the railroad to the two major hospitals. The top priority is a grade separation for access to Del E. Webb Hospital near Meeker/Reems intersection with Grand Avenue. Implementation of these items will be dependent on the solution chosen, identification and commitment of a funding source, and agency sponsorship.

The proposed El Mirage Road grade separation and extension southward and other potential options should be further evaluated in the Northwest Transportation Study.

In order to advance the development of the transit system in the area, a funding source must be identified. Ideally, this funding source would span across jurisdictional boundaries so that a unified system can be implemented. The local communities are urged to work toward this end.

The existing law limiting cart usage on streets with speed limits of 35 mph or less should be retained.

The above actions are recommended for completion in the near term depending on the availability of funding.

Priority Two

When the regional (or other) source for funding is identified, an integrated dial-a-ride system should be developed along with extension of the metropolitan bus system along the arterials. The park-and-ride lot slated for the general area of Bell Road and Grand Avenue should also be implemented.

The local communities should encourage and financially participate in the development of the non-motorized transportation and recreation corridors planned along the rivers and the connection of these corridors to the residential area. Connections should be provided for pedestrians and bicyclists.

Local governments should also follow up on studies and action plans for specific signage and marking needs designed specifically for the senior population and for the specific needs for carts.

Priority Three

As part of a more long-term program, grade separations at El Mirage, Meeker/Reems, and at 103rd Avenue have been suggested. Further studies should be conducted to help further define the concepts to be advanced at each location. Implementation of these grade separations will depend upon the availability of funding and the support and sponsorship of the local governments. The need for the grade separations should be further identified in the Northwest Area Transportation Study and updated periodically as future developments in the area become better defined.

Long-Term Needs

The Bell Road/Grand Avenue intersection will be improved as part of the Priority One basic highway improvements (additional lanes, no grade separation). As development continues and other improvements are made outside the corridor, the traffic at this intersection should be monitored to determine when or if additional improvements may be needed.

ESTIMATED COST

General cost estimates were made for some of the major recommended roadway improvements. The estimates include the cost of right-of-way and are based on unit cost in 2001. These estimates are very preliminary and may change substantially based on more detailed engineering and project development. Additional definition is needed for the transit, pedestrian, bicycle, and electric cart projects before reliable cost estimates can be made. Estimates of costs for transit and other alternative modes are expected as part of the MAG Northwest Area Transportation Study. Projects from this list or other projects from the list of recommendations above may be recommended for funding as part of the MAG RTP process.

Recommended Improvement	Cost (in millions)	Responsible Agency
Priority One		
• Widen Grand Avenue to six lanes	$30	ADOT
• Add turn lanes on cross streets	$9	Local Jurisdictions
• Intelligent transportation systems	$2.5	ADOT/Regional/Local Jurisdictions
• Meeker/Reems grade separation	$30	ADOT/Regional/Local Jurisdictions
interchange or Emergency-only grade separation	$6	Local Jurisdictions/Private/Regional
Priority Three		
• El Mirage Road grade separation and extension	$35	ADOT/Regional/Local Jurisdictions
• 103rd Avenue grade separation	$24	ADOT/Regional/Local Jurisdictions

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF EXHIBITS

LIST OF EXHIBITS (continued)

1.0 INTRODUCTION

The Grand Avenue Northwest Corridor Study encompasses that portion of Grand Avenue (US 60) between SR 303L and SR 101L. The 11.5-mile segment passes through the City of Surprise, City of El Mirage, City of Peoria, Town of Youngtown, and the unincorporated communities of Sun City West and Sun City. The existing roadway provides two travel lanes in each direction except for a short section in Sun City where three lanes in each direction are provided. The Arizona Department of Transportation (ADOT) is the owner-operator of the roadway. The roadway is being widened to four-lane divided from the northwestern end of the corridor to the west to Morristown. The Burlington Northern Santa Fe Railroad (BNSF) parallels Grand Avenue on the north side of the roadway. There are 18 traffic signals on Grand Avenue in the segment. There are no grade separations, but there are two major river crossings.

The northwest area is rapidly developing. The City of Surprise is one of the fastest growing cities in the metropolitan area. The large planned communities in the area were developed in such a manner that there are few continuous arterial streets. As a result, Grand Avenue and Bell Road carry the majority of the arterial traffic as well as US 60 traffic.

The Grand Avenue Northwest Corridor Study was commissioned by the Maricopa Association of Governments (MAG) in cooperation with its member agencies. The purpose of the study is to determine the transportation needs of the corridor and to build a consensus among the jurisdictions and public. The study was focused primarily at the highway needs but also included transit, bicycle, pedestrian, and electric cart needs.

During the study process, eight working papers were produced and presented for public and stakeholder consultation. All project materials including working papers, maps, surveys as well as meeting agendas, presentations, and notes were made available on the project page on the MAG web site. Two public meetings and six agency/community forums were held to review the papers and to obtain ideas and review and comment on study products. Separate meetings were held upon request with stakeholder groups, including Sun City West Property Owners and Residents Association, Sun City Home Owners Association, Sun City Grand Coalition, SunHealth Systems, and development interests. Working Papers 2 through 8 were slightly modified and incorporated into this final report as Chapters 2 through 8, respectively. Working Paper 1 provided a list and brief summary of previous and related documents regarding the study corridor. These data are in the Appendix.

In addition to seven chapters derived from the working papers, Chapter 9 provides the study recommendations, and Chapter 10 provides documentation of the agency and public input to the process.

The recommendations are believed to be realistic and achievable. The major highway recommendations are generally the responsibility of ADOT and will need to be funded over the next several years. In many cases, a collaborative effort will be needed among state, regional, and local jurisdictions to provide effective implementation of the plan.

2.0 CURRENT AND PROJECTED SOCIOECONOMIC CONDITIONS

2.1 INTRODUCTION AND PURPOSE

This chapter presents the current and projected socioeconomic conditions for the Grand Avenue Northwest Corridor influence area bounded by SR 74 on the north, Northern Avenue on the south, 67th Avenue on the east and Rooks Road on the west.

The official Maricopa Association of Governments (MAG) socioeconomic projections of population and employment, documented in this chapter, were used as an input into the MAG regional traffic forecast model to develop traffic forecasts for the corridor. The resulting traffic forecasts are presented in Chapter 6.0. In addition to the MAG forecasts, an alternative higher growth scenario for year 2025 was developed for the influence area and used in a sensitivity analysis. Traffic forecasts were also generated using the alternative higher growth projections. These traffic forecasts when compared to the MAG traffic forecasts provide a means of determining the impact to future Grand Avenue traffic volumes if population and employment growth in the influence area are higher than the MAG projections.

The two sets of traffic forecasts were used to choose appropriate year 2025 design volumes for the corridor. The design volumes were used to identify transportation improvements that provide adequate capacity in the corridor.

2.2 COMPARISON OF SOCIOECONOMIC PROJECTIONS

The following currently available socioeconomic projections were reviewed in this study. The forecasts are based on the 1995 Special Census for Maricopa County. Census 2000 based forecasts were not available at the time of preparation of this paper.

- Year 2000, 2010, and 2020 official MAG Adopted Projections
- Year 2025 MAG Design Projections (based on MAG Adopted Projections at the Regional Analysis Zone level)
- Year 2020, 2040 and buildout projections from the MAG 303 Alignment Alternative Study
- Year 2020 "sensitivity" projections from the Northwest Valley Transportation Study (Maricopa County Department of Transportation, June 2000)

Exhibit 2.1 compares various projected population and employment totals for the Grand Avenue area of influence defined in Section 2.0. The buildout scenario, which reflects the ultimate carrying capacity of the area and is not tied to a particular year, has by far the highest population

and employment levels. The 2040 MAG 303 Alignment Alternative Projections are also substantially higher than those for earlier years; however, they are less than half of the buildout projections. These projections show that most of the northwest portion of the area of influence will remain sparsely developed through 2040, but not at buildout. Exhibit 2.1 shows that the 2025 population for the influence area is expected to approximately double over year 2000 projections. Employment totals are expected to more than double by 2025.

The Alternative Higher Growth Projections are also shown in Exhibit 2.1. The development of these projections is discussed in the next section.

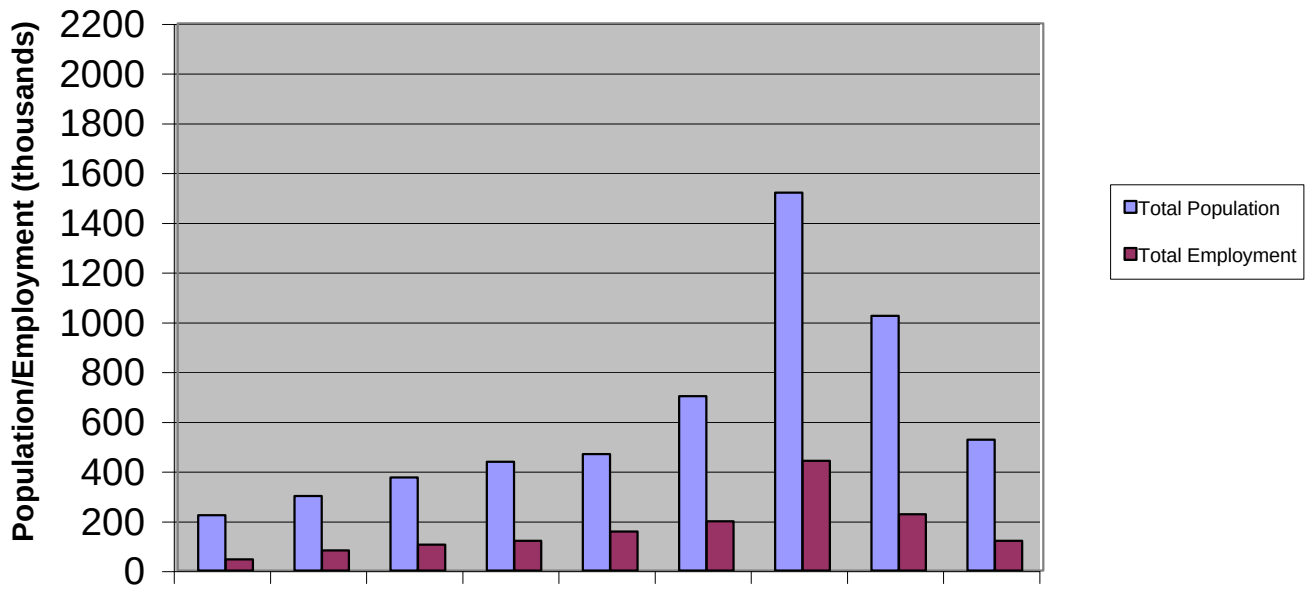
The population and employment density by Traffic Analysis Zone (TAZ) for Year 2000 MAG Adopted Projections and Year 2025 MAG Design Projections are included in this chapter. Exhibits 2.2 through 2.5 illustrate the projections.

2.3 ALTERNATIVE HIGHER GROWTH PROJECTIONS

The MAG 303 Alignment Alternative Projections for the year 2020 and 2040 (Scenarios 5 and 6 from Exhibit 2.1) were utilized as the basis for creating Alternative Higher Growth Projections for the sensitivity analysis. The 2020 MAG 303 Alignment Alternative scenario generally shows higher population and employment densities in the currently undeveloped northern and western portions of the area of influence than either Scenario 3 (2020 MAG Adopted Projections) or Scenario 4 (2025 MAG Design Projections). It therefore represents a conservative choice for traffic forecasting purposes. Scenario 8 (based on the Northwest Valley Transportation Study sensitivity analysis), although higher, is not directly comparable because it covers a larger area.

Alternative Higher Growth Projections were developed for the area of influence. The control total for this area was a linear interpolation between the 2020 and 2040 population and employment estimates from the MAG 303 Alignment Alternative Study. One-fourth of the 2020-2040 growth in both population and employment in the area of influence is assumed to occur between 2020 and 2025. Exhibit 2.6 shows the resulting 2025 alternative higher growth population and employment totals for the area of influence, along with the projected growth in number of residents and jobs from 2020 to 2025.

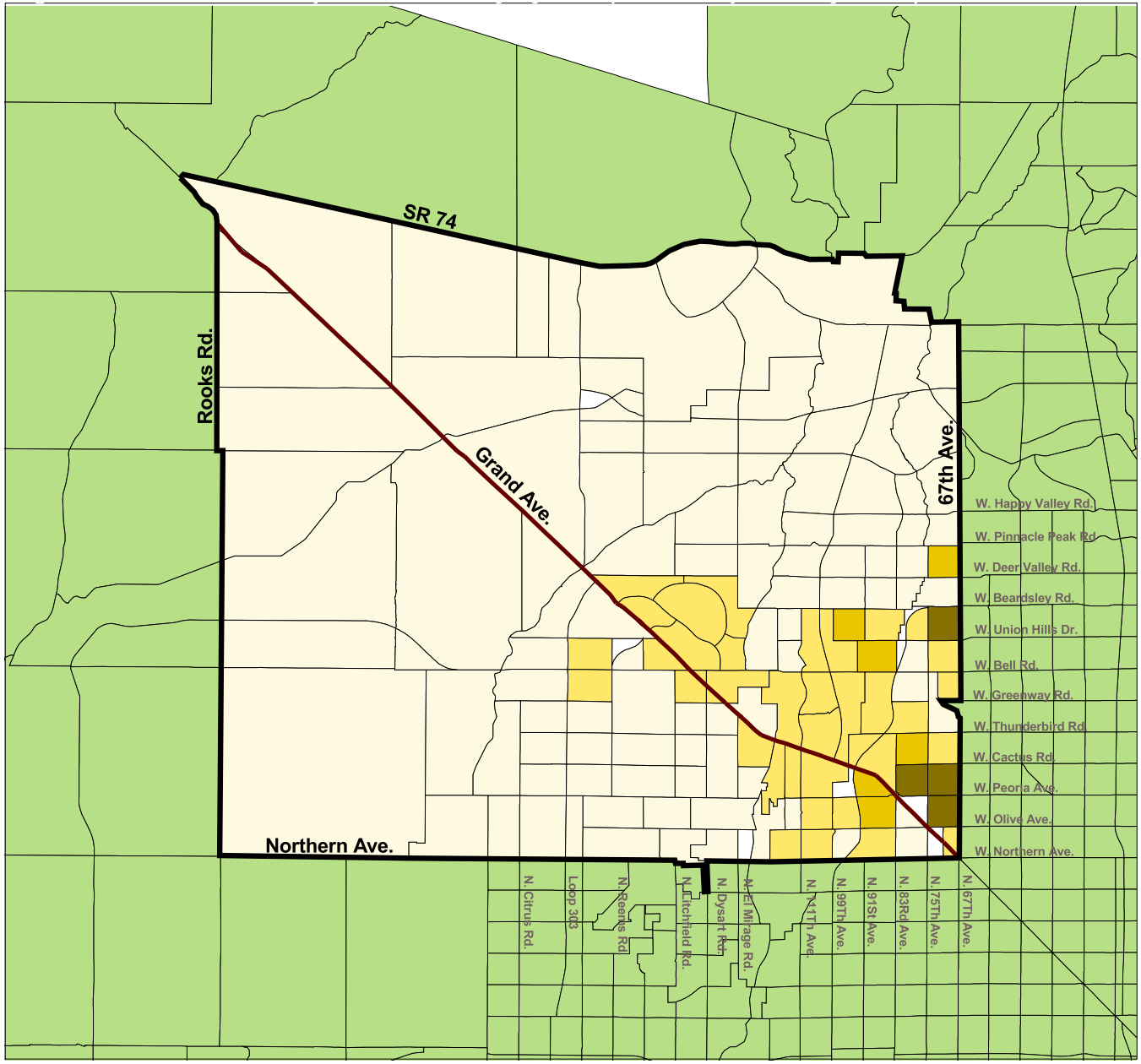
Exhibit 2.1
Projected Population and Employment
Grand Avenue Area of Influence *



* Area bounded by SR 74 on north; Northern Avenue on south; 67th Avenue on east; Rooks Road on west.

Notes:
1 - Year 2000 MAG Adopted Projection.
2 - Year 2010 MAG Adopted Projection.
3 - Year 2020 MAG Adopted Projection.
4 - Year 2025 MAG Design Projection.
5 - Year 2020 MAG 303 Alignment Alternative Projection.
6 - Year 2040 MAG 303 Alignment Alternative Projection.
7 - Buildout MAG 303 Alignment Alternative Projection.
8 - Year 2020 Sensitivity Analysis (Northwest Valley Transportation Study - represents a larger study area than the other projections).
9 - Year 2025 Alternative Higher Growth Projection.

Exhibit 2.2. Year 2000 Population Density by TAZ (MAG Adopted Projection)



Grand Avenue Northwest Corridor Study

Population Density Per Square Mile

Population Density
- 0 - 1499
- 1500 - 3999
- 4000 - 6499
- 6500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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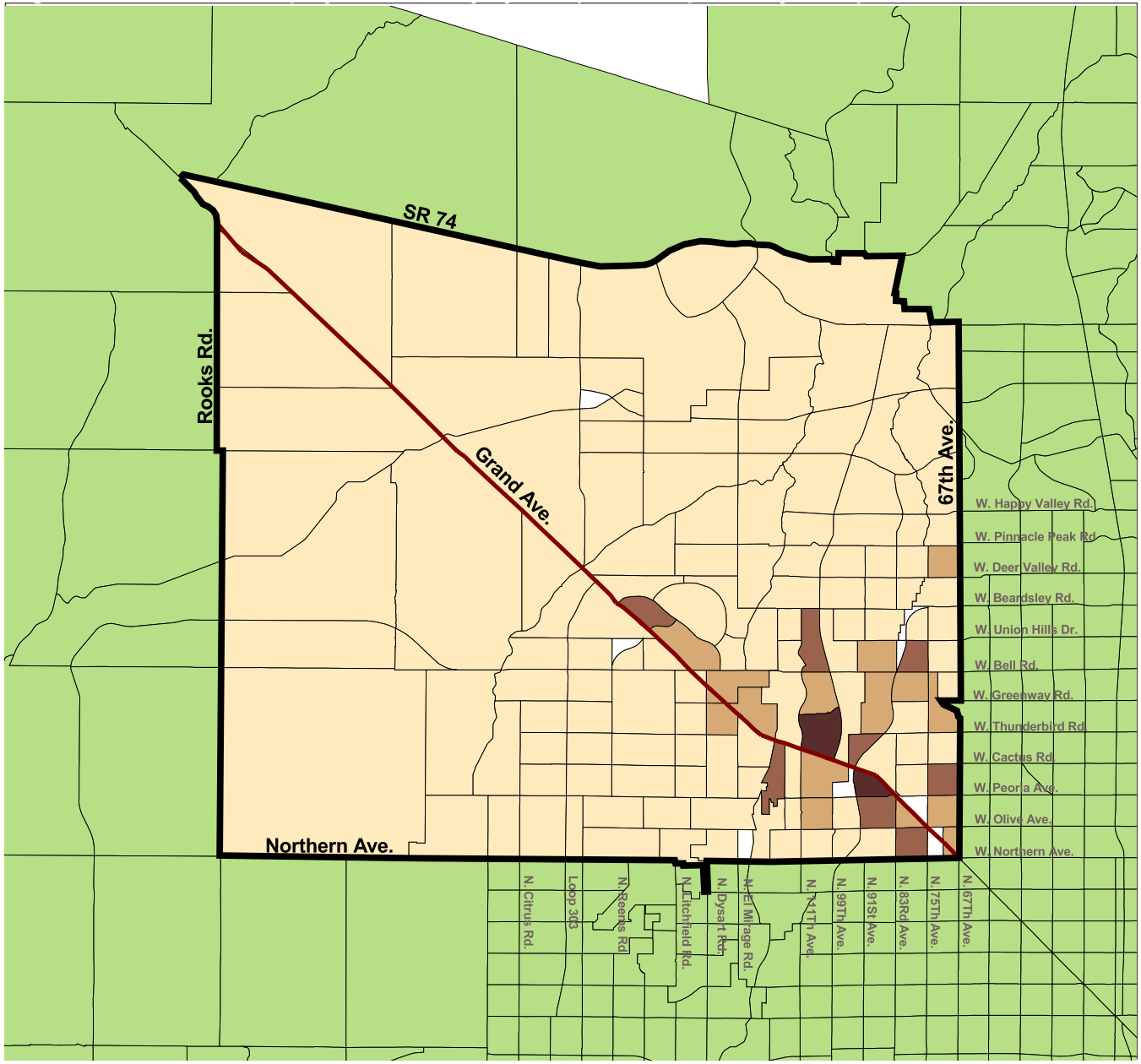
Exhibit 2.3. Year 2000 Employment Density by TAZ (MAG Adopted Projection)



Grand Avenue Northwest Corridor Study

Employment Density Per Square Mile

Employment Density
- 0 - 499
- 500 - 999
- 1000 - 1499
- 1500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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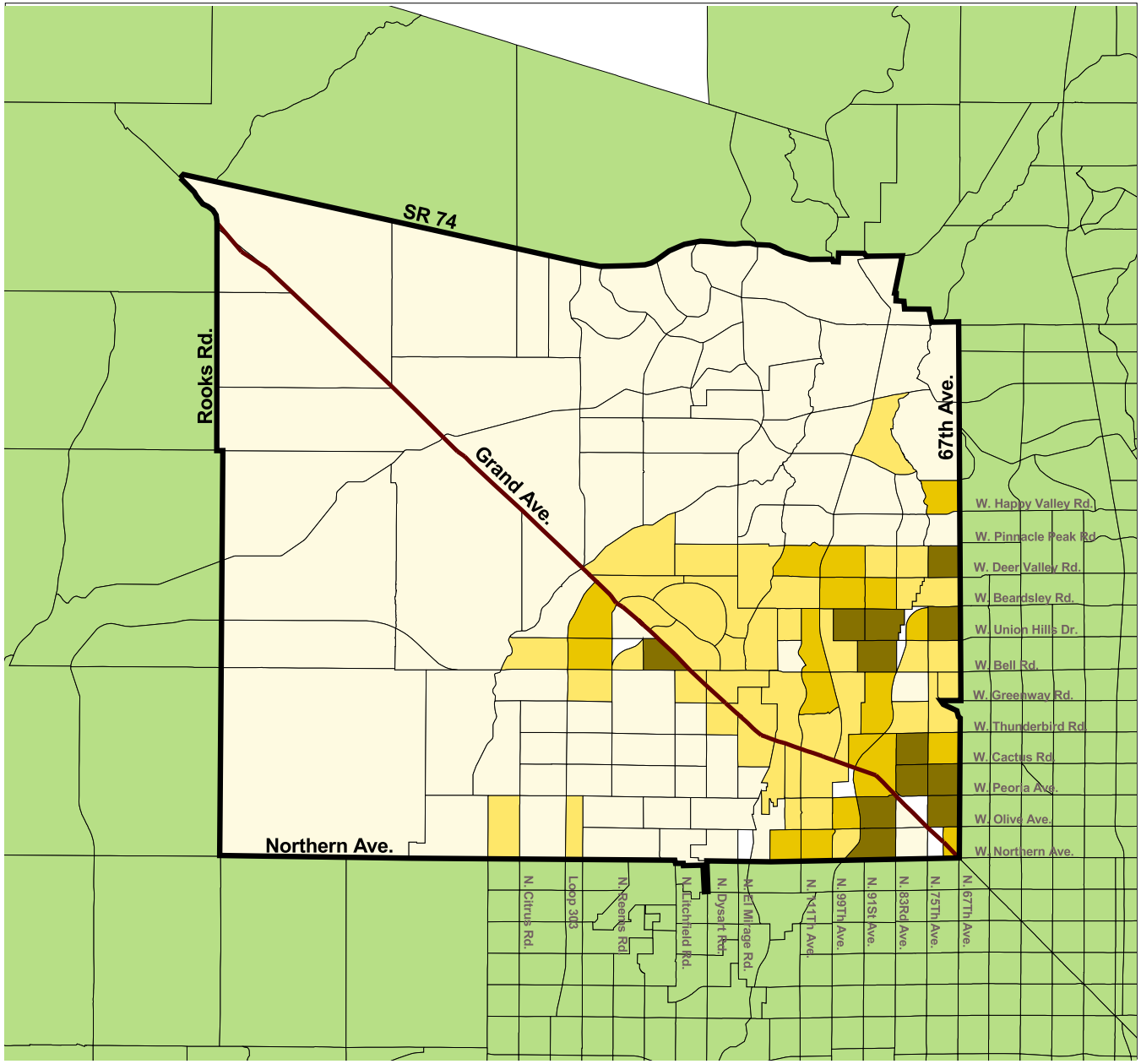
Exhibit 2.4. Year 2025 Population Density by TAZ (MAG Design Projection)



Grand Avenue Northwest Corridor Study

Population Density Per Square Mile

Population Density
- 0 - 1499
- 1500 - 3999
- 4000 - 6499
- 6500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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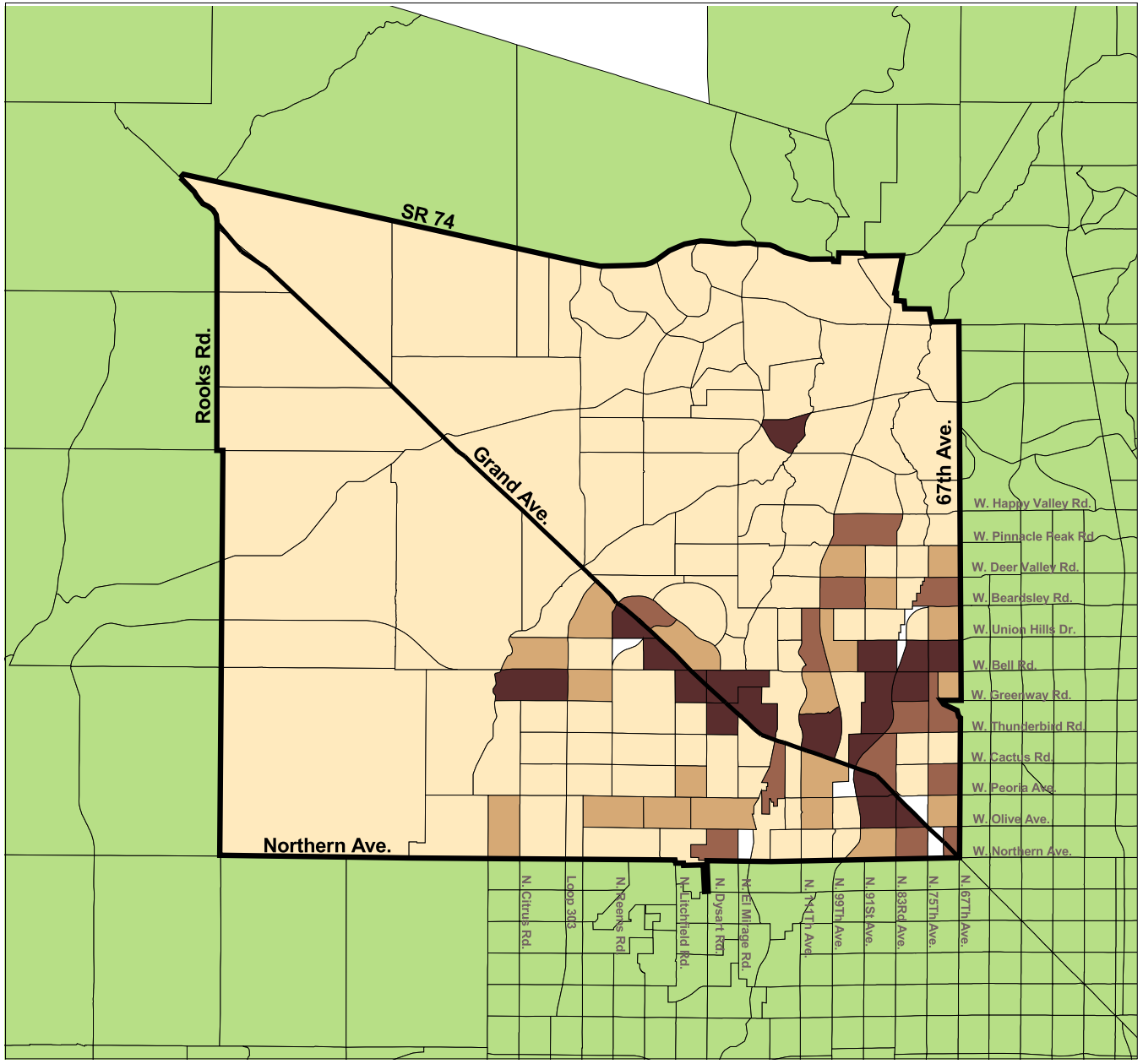
Exhibit 2.5. Year 2025 Employment Density by TAZ (MAG Design Projection)



Grand Avenue Northwest Corridor Study

Employment Density Per Square Mile

Employment Density
- 0 - 499
- 500 - 999
- 1000 - 1499
- 1500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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Exhibit 2.6
Interpolated Year 2025 "MAG 303 Alignment Alternative"
Population and Employment Estimates
Grand Avenue Northwest Corridor Area of Influence

	2020	2040	2025*	2020-2025 Growth
Population	468,075	700,684	526,227	58,152
Employment	156,708	198,267	167,098	10,390

*Estimated by linear interpolation between 2020 and 2040 projections.

Exhibit 2.7 compares existing population and employment totals for the area of influence with the 2025 Alternative Higher Growth Projections. It shows a projected 136% increase in population and a 269% increase in employment.

Exhibit 2.7
Projected Population and Employment Growth, 2000-2025
Alternative Higher Growth Scenario
Grand Avenue Northwest Corridor Area of Influence

	2000	2025 Alternative Higher Growth Projection	2000-2025 Growth	
			Total	Percent Increase
Population	223,166	526,227	303,061	136%
Employment	45,234	167,098	121,864	269%

Because the MAG traffic forecasting model utilizes population and employment numbers by TAZ, the interpolated 2025 population and employment totals for the area of influence were broken down into TAZ-level 2025 projections. The following methodology using the consultant's judgment was followed to develop TAZ-level projections.

- For each individual TAZ, the MAG 2020 303 Alignment Alternative Projections were used unless the 2025 MAG Design Projections were higher, then they were used.
- Next, the sum of these preliminary TAZ values was compared to the corresponding control total (for population or employment) from Exhibit 2.6. As expected using this methodology, both the population and employment totals in Exhibit 2.6 exceeded the sum of the preliminary TAZ values.
- For both population and employment, the difference between the control total and the TAZ-level sum was distributed using the consultant's judgment among TAZs whose 303 Alignment Alternative Projection for 2040 exceeded the preliminary 2025 projection by a large amount. Thus, most of the population and employment growth during the

period 2020-2025 was allocated to those zones with a high growth potential for the years 2020-2040.

Exhibits 2.8 and 2.9 illustrate population and employment density per square mile by TAZ, according to the 2025 Alternative Higher Growth Projections.

2.4 SUMMARY

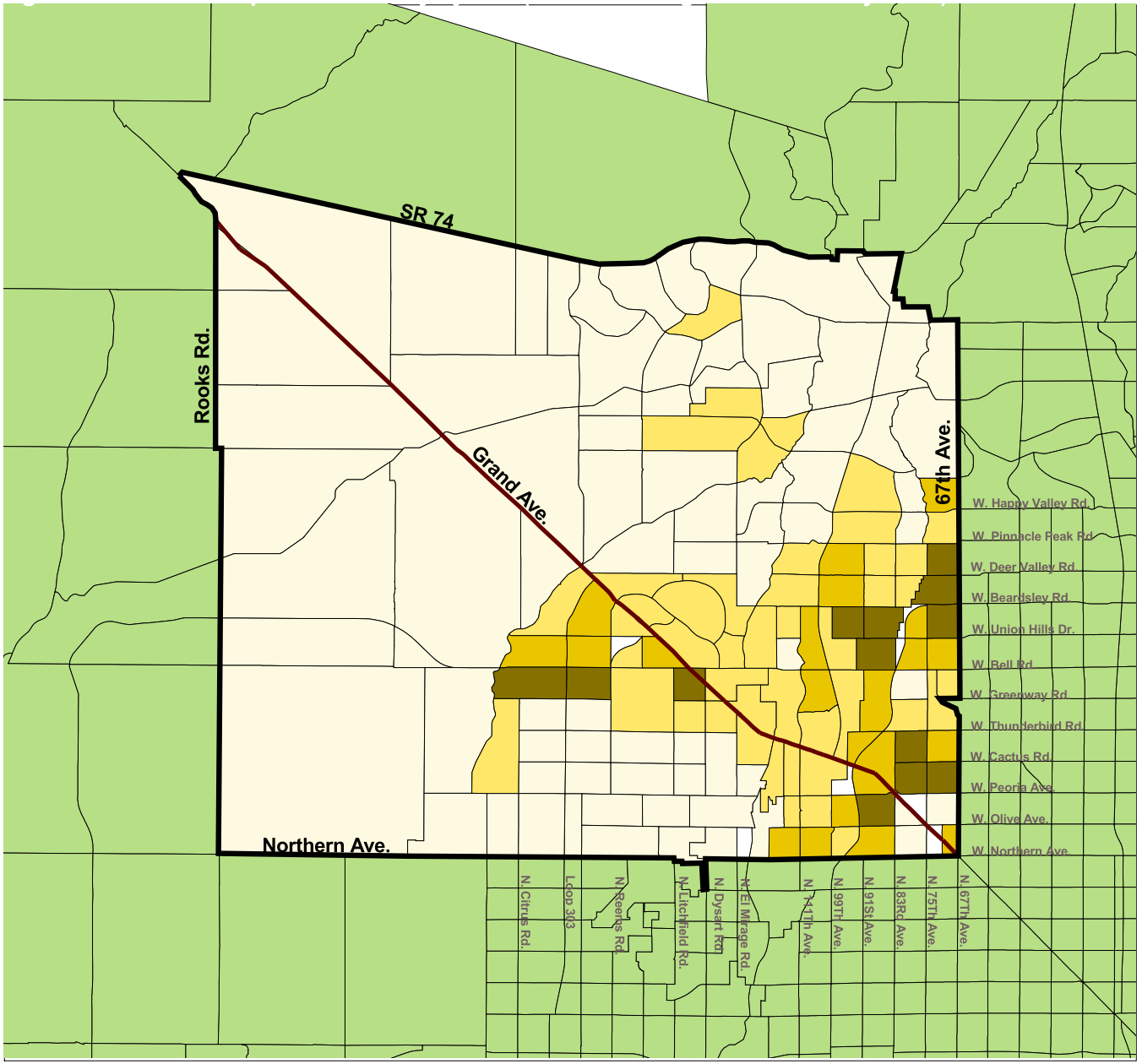
As shown in Exhibit 2.10, the total study area population for the Alternative Higher Growth Projections exceeds the MAG 2025 Projections estimate by 20%. Total study area employment for the Alternative Higher Growth Projections exceeds the MAG 2025 Projections estimate by 40%. As shown in Exhibits 2.8 and 2.9, more TAZs are shown with high population densities (6,500 or more residents per square mile) and high employment densities (1,500 or more per square mile) when compared with the MAG Design Projections (Exhibits 2.4 and 2.5).

Exhibit 2.10
Comparison of Socioeconomic Projections
Grand Avenue Northwest Corridor Area of Influence

Projections	Population	Employment
2000 MAG Adopted	223,000	45,000
2025 MAG Design	437,000	120,000
2025 Alternative Higher Growth	526,000	167,000

Both the official MAG 2025 Design Projections and the 2025 Alternative Higher Growth Projections were inputs into the MAG regional traffic forecast model. The two sets of traffic forecasts were used to choose appropriate year 2025 design volumes for the corridor. These design volumes were used to identify transportation improvements that provide adequate capacity in the corridor.

Exhibit 2.8. Year 2025 Population Density by TAZ (Alternative Higher Growth Projection)



Grand Avenue Northwest Corridor Study

Population Density Per Square Mile

Population Density
- 0 - 1499
- 1500 - 3999
- 4000 - 6499
- 6500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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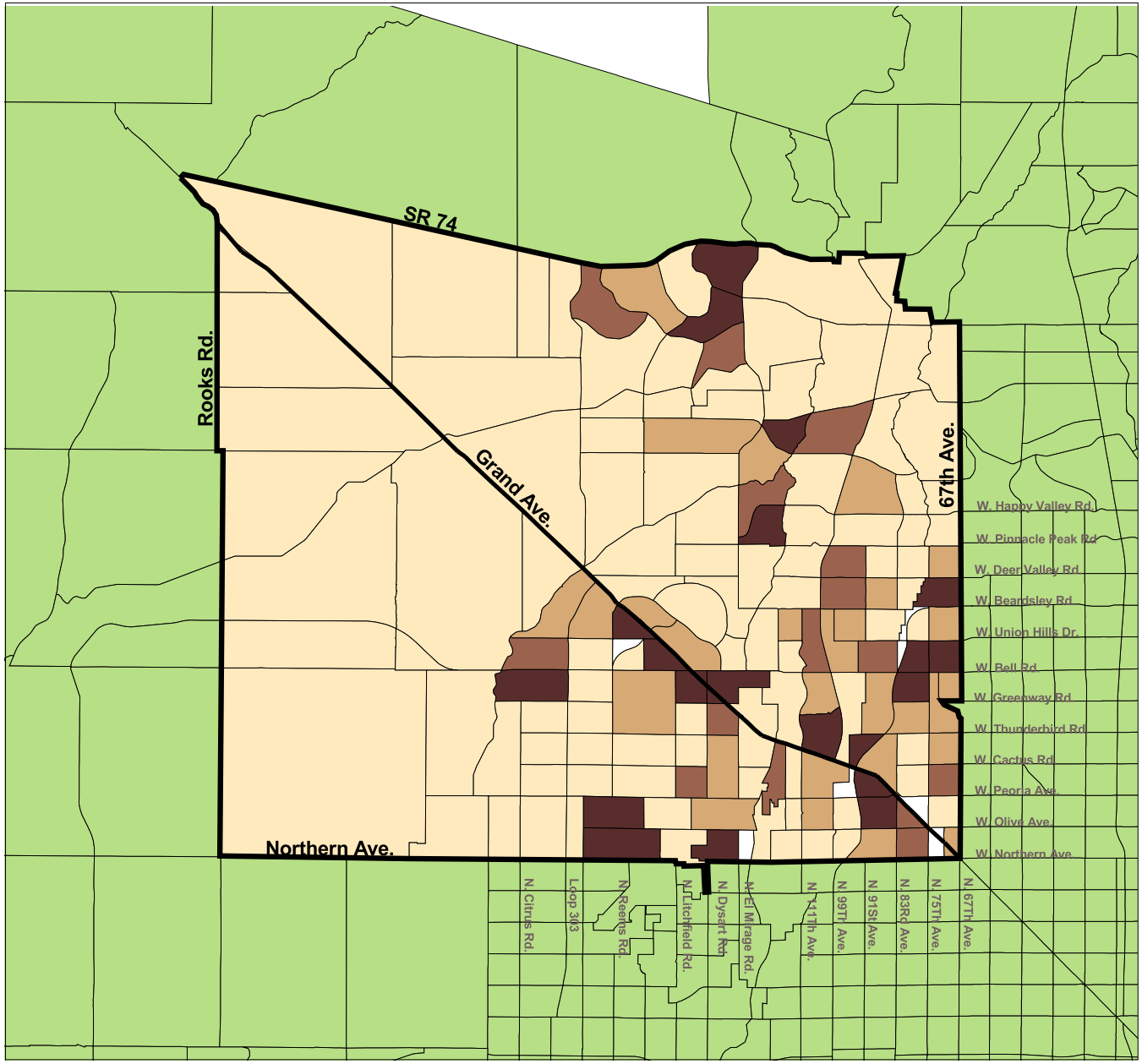
Exhibit 2.9. Year 2025 Employment Density by TAZ (Alternative Higher Growth Projection)



Grand Avenue Northwest Corridor Study

Employment Density Per Square Mile

Employment Density
- 0 - 499
- 500 - 999
- 1000 - 1499
- 1500 +
- No Data

Base Map Features
- Area of Influence
- Grand Avenue
- TAZ Boundaries

N

Source: 2000 TAZ Data, Maricopa Association of Governments
URS Corporation, January, 2001

5 0 5 Miles

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3.0 EXISTING TRANSPORTATION FACILITIES AND CONDITIONS

3.1 INTRODUCTION

This chapter documents the current transportation facilities and conditions within the study area. The corridor study area extends approximately 11.5 miles from SR 303L – Estrella Parkway to SR 101L – Agua Fria Freeway. A larger influence area was looked at for traffic demand modeling purposes. The Grand Avenue Northwest model area is bounded by SR 74 on the north; Northern Avenue on the south; 67th Avenue on the east; and Rooks Road on the west.

3.2 ROADWAY FACILITIES

3.2.1 Grand Avenue

Grand Avenue is a four- to six-lane arterial street that enters the Greater Phoenix Metropolitan Area in the northwest corner and extends diagonally southeastward to downtown Phoenix. Grand Avenue was initially opened to traffic in 1888 to link the agricultural areas in the West Valley to Phoenix. The BNSF was subsequently built adjacent to Grand Avenue. Grand Avenue is designated as US 60. It serves a modest amount of through traffic, a more significant amount of traffic between the metropolitan area and points northwest, and serves mostly moderately length urban trips that begin and end in the urban area.

An inventory of existing roadway features along Grand Avenue is shown in Exhibits 3.1 and 3.2. Generally, Grand Avenue is a four-lane divided highway/urban arterial street through the study area. Six lanes exist between approximately 103rd Avenue and 99th Avenue. A two-way frontage road parallels Grand Avenue between Dysart Road and the Agua Fria River. There is 170 feet of right-of-way along Grand Avenue between SR 303L and Bell Road. The right-of-way then widens to 215 feet at Dysart Road for the frontage road. Between Dysart Road and Thunderbird, 215 feet of right-of-way is available. East of Thunderbird Road to 111th Avenue, right-of-way width varies from 105 to 160 feet. Between 111th Avenue and the New River, right-of-way varies between 130.8 to 138.4 feet. A series of cross-sections along the corridor are contained in the Appendix.

A total of 18 signalized intersections (including two at SR 101L) are located along Grand Avenue within the study area. An additional 9 unsignalized intersections or median breaks are located within the study area. All the intersections have exclusive left turn lanes while many also have exclusive right turn lanes. Exhibit 3.3 summarizes the intersections within the study area and the number of lanes for each intersection approach leg.

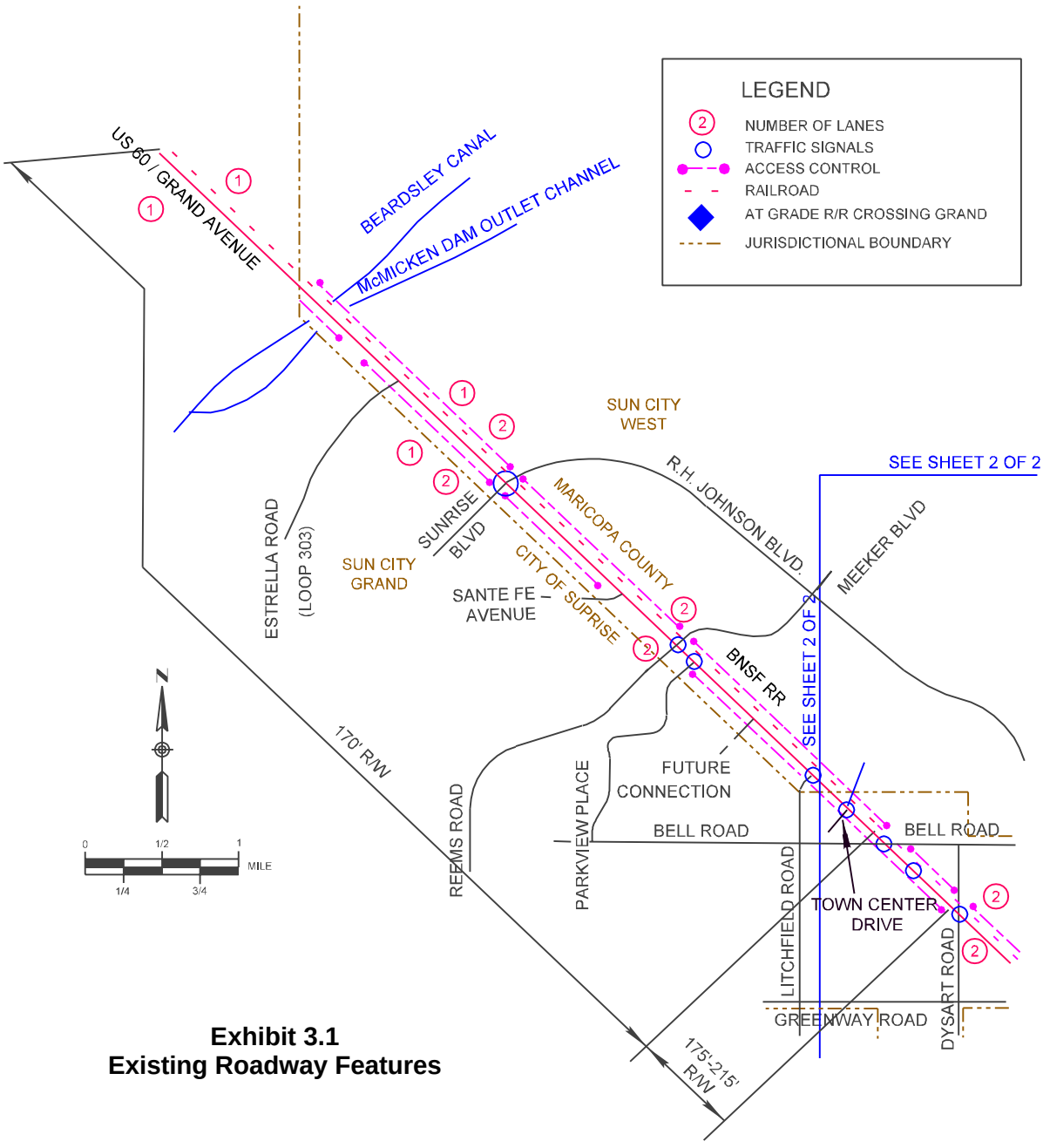

Exhibit 3.1
Existing Roadway Features

Grand Avenue
Northwest Corridor Study

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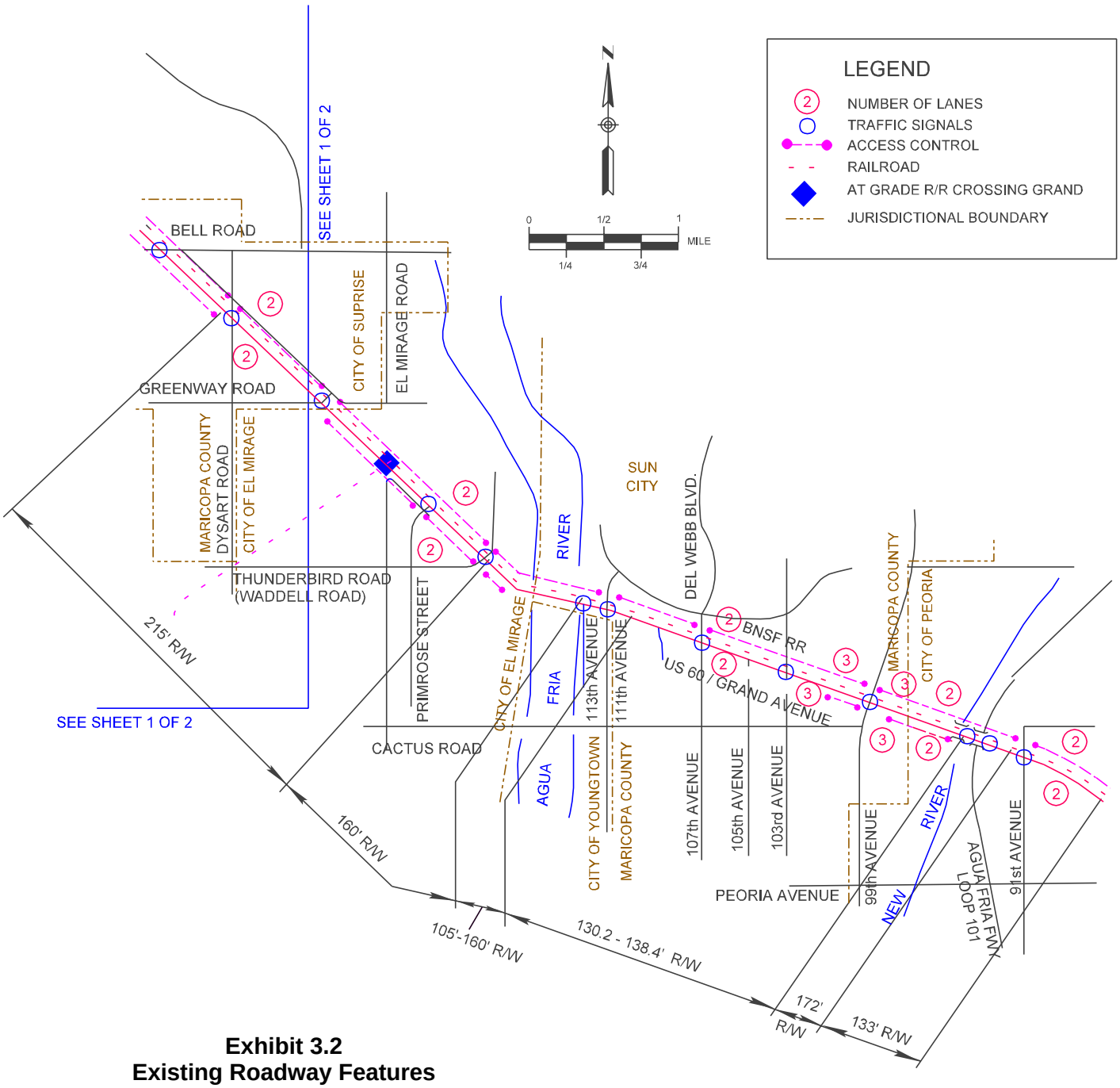

Exhibit 3.2
Existing Roadway Features

Grand Avenue
Northwest Corridor Study

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Exhibit 3.3 Existing Geometry at Intersections along Grand Avenue

Intersection[1]	Signal	Number of Lanes																
		North Approach			South Approach			East Approach			West Approach			Northwest Approach			Southeast Approach		
		L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R
Loop 303	No	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1	0
RH Johnson Blvd/ Sunrise Blvd	Yes	1	2	0	1	2	1	0	0	0	0	0	0	1	2	1	1	2	1
Sante Fe Avenue	No	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	2	0
Reems Rd/Meeker Blvd	Yes	1	2	1	1	2	1	0	0	0	0	0	0	1	2	1	1	2	1
Parkview Pl	Yes	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	2	0
Litchfield Rd	Yes	0	0	0	2	0	1	0	0	0	0	0	0	0	2	1	2	2	0
Town Center Drive	Yes	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	2	0
Bell Rd	Yes	0	0	0	0	0	0	1	2	1	1	3	0	1	2	0	1	2	1
Dysart Rd	Yes	1	1	0	1	1	0	0	0	0	0	0	0	1	2	0	1	2	1
Sunny Lane	No	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	2	0
Greenway Rd	Yes	0	0	0	0	0	0	1	1	0	1	1	1	1	2	0	1	2	1
Shopping Center	No	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	1	2	0
Primrose St	Yes	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	2	0
Thompson Ranch Rd/ Thunderbird Rd	Yes	1	1	0	1	1	1	0	0	0	0	0	0	1	2	0	1	2	1
113th Ave	Yes	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	2	0
111th Ave	Yes	1	1	0	1	2	0	0	0	0	0	0	0	1	2	0	1	2	0
108th Ave	No	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	2	0
107th Ave/Del Webb Blvd	Yes	1	2	1	1	2	1	0	0	0	0	0	0	1	2	0	1	2	0
106th Ave	No	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	1	2	0
S 105th Ave	No	0	0	0	0	1	0	0	0	0	0	0	0	1	3	0	1	2	0
103rd Ave	Yes	1	2	0	1	1	1	0	0	0	0	0	0	1	3	0	1	3	0
101st Ave	No	0	0	0	0	1	0	0	0	0	0	0	0	1	3	0	1	3	0
99th Ave	Yes	1	2	1	1	2	1	0	0	0	0	0	0	1	3	0	1	3	0
Median Break	No	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	2	0
Loop 101 SB On Ramp	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0
Loop 101 NB Off Ramp	Yes	0	0	0	1	1	1	0	0	0	0	0	0	0	2	0	0	4	0

[1.] Includes all intersections with Grand Avenue that have a median break.

Additional access along the northeast side of Grand Avenue is restricted due to the railroad to intersecting streets only. Access on the southwest side of Grand Avenue is generally unrestricted in Surprise. In El Mirage, a drainage channel restricts access to intersecting streets. Through the Sun City area of Maricopa County, access is only restricted at walls surrounding adjacent neighborhoods.

Grand Avenue crosses the Agua Fria River, the New River and SR 101L on bridges. Four lanes of travel (two in each direction) are provided over all of the bridges. The bridges over the Agua Fria River and SR 101L are wide enough to accommodate six travel lanes (three in each direction). A railroad spur, Ennis Spur, crosses Grand Avenue at grade just north of Primrose Street.

3.2.2 Surrounding Grid System

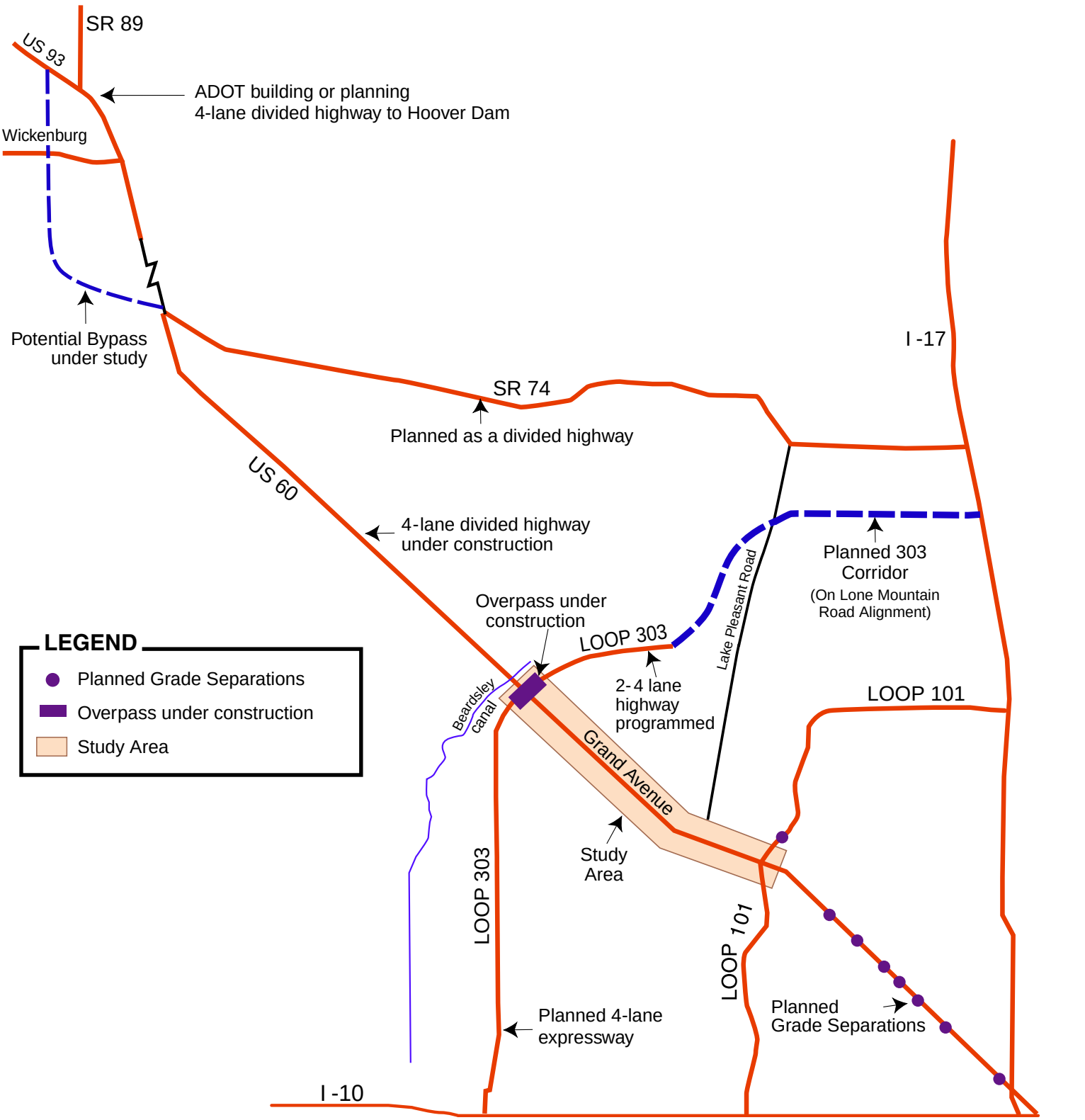
The metropolitan grid system of one-mile spaced arterial streets is disrupted in the Northwest Valley area because of the BNSF Railroad, development patterns, Luke Air Force Base (Luke AFB), Agua Fria River and the New River. North of Camelback Road, only Grand Avenue, Northern Avenue, Olive Avenue, and Bell Road are continuous between SR 101L and SR 303L. In the north-south direction, only 99th Avenue and 107th Avenue cross Grand Avenue and provide continuous extended travel (several miles) both north and south of Grand Avenue. SR 303L is an existing County-maintained two-lane highway from Grand Avenue south to I-10. SR 74 is an existing two-lane highway that connects Grand Avenue to I-17 north of the study area. The absence of a more complete street network places extra traffic burden on those few continuous streets including Grand Avenue, Bell Road, and 99th Avenue. Exhibit 3.4 shows the continuous routes within the study area.

3.2.3 Programmed Roadway Improvements

The following projects are programmed for the corridor outside of the study area. The projects are illustrated in Exhibit 3.5. Federal legislation already specifies US 93 in the vicinity of Phoenix to be part of the Canada-to-Mexico "CANAMEX" Highway. The route within the Maricopa region has not been specified in federal legislation yet. MAG has recently taken action to recommend the designation of the route through the Maricopa region to include I-8, SR 85, an alignment in the vicinity of the existing Wickenburg Road/Vulture Mine Road, connecting to the Wickenburg Bypass, and the Bypass west from that point connecting to US 93. ADOT is spending over $250 million to upgrade US 93 to a four-lane divided highway through its entire length in Arizona. US 93 connects with US 60 in Wickenburg. In addition, ADOT is evaluating a bypass around Wickenburg to serve the US 93/US 60 through traffic.

ADOT will begin construction on the portion of Grand Avenue (US 60) from north of the Beardsley Canal to near the Morristown railroad overpass. This project will complete Grand Avenue as a four- or six-lane roadway from Phoenix to Wickenburg.

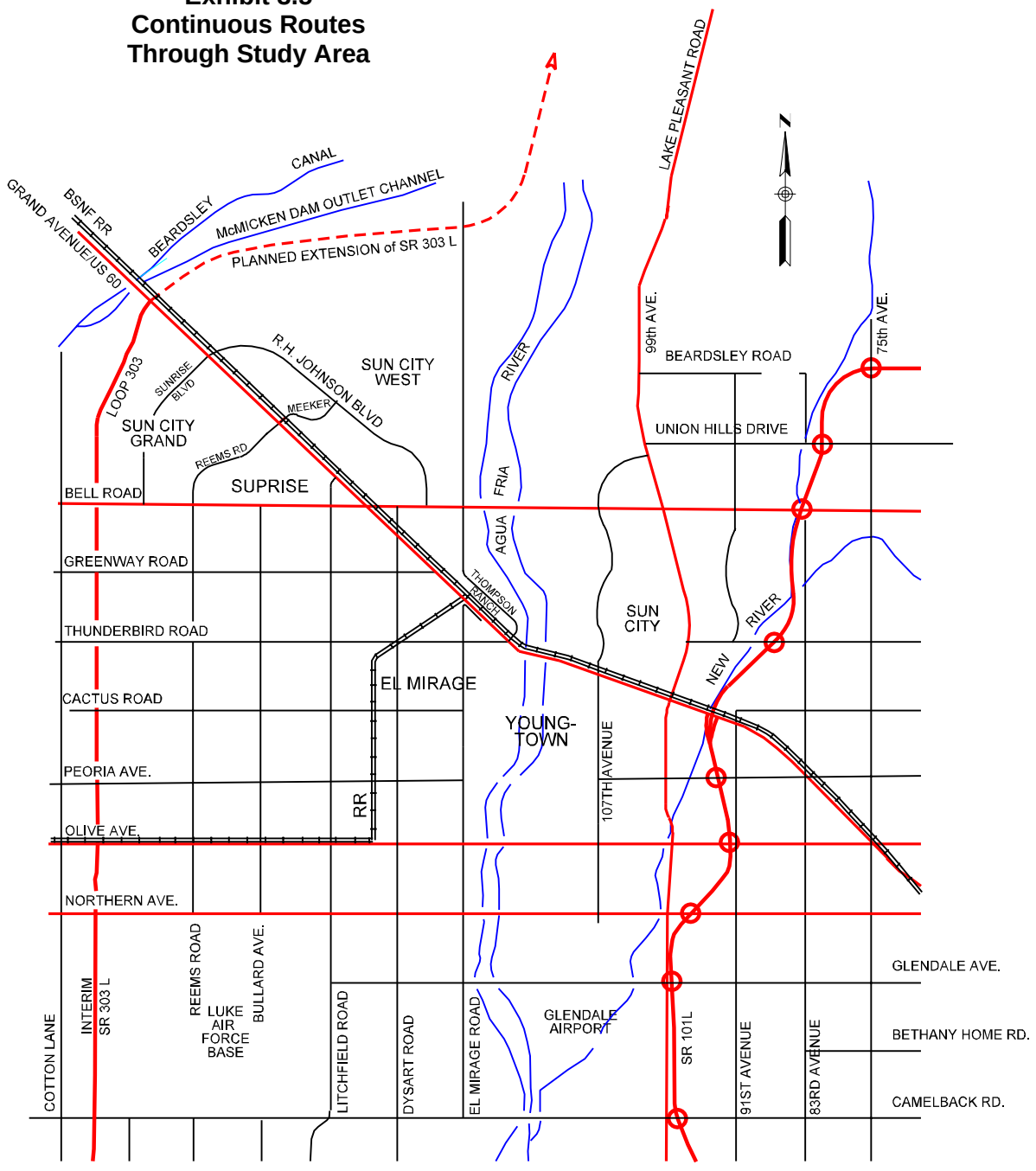
Exhibit 3.4
Planned Roadway Improvements



Grand Avenue
Northwest Corridor Study

MARICOPA ASSOCIATION of GOVERNMENTS
URS

Exhibit 3.5
Continuous Routes Through Study Area



Existing Continuous Route Through Study Area

BNSF Railroad

Planned Continuous Route Through Study

N

Grand Avenue Northwest Corridor Study

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URS

On Grand Avenue east of SR 101L, ADOT has programmed to complete seven new grade separations to take one of the streets out of the six-legged intersections. Access to SR 101L is also being improved at 91st Avenue. A northbound on-ramp and southbound off-ramp are being constructed. These improvements will help eliminate notorious bottlenecks on Grand Avenue and can affect traffic on Grand Avenue through the study area west of SR 101L.

For SR 303L, an overpass over Grand Avenue and BNSF Railroad is under construction. The road will be extended to Lake Pleasant Road as a controlled access at-grade highway. SR 303L will initially be four lanes between Grand Avenue and El Mirage Road and two lanes between El Mirage Road and Lake Pleasant Road. SR 303L is planned to be upgraded to a four-lane divided highway and eventually extended from MC 85 to I-17. The current MAG Long Range Transportation Plan specifies this facility to be a four-lane controlled access expressway.

SR 74 is planned by ADOT as a four-lane divided limited access highway from US 60 Grand Avenue to I-17. The eastern portion of this route is also a candidate for the future location of SR 303L.

3.2.4 BNSF Railroad

The BNSF parallels Grand Avenue along the northeast side through the study area. The railroad right-of-way is 195-200 feet wide between SR 303L and Dysart Road except near RH Johnson Boulevard where it bubbles out to +500 feet.

The right-of-way narrows to 100 feet between Dysart Road and the Agua Fria River. There is additional right-of-way at the El Mirage Auto Distribution Facility. Right-of-way between the Agua Fria River and 99th Avenue is approximately 85 feet.

The following at-grade railroad crossings and protection systems are provided:

RH Johnson Boulevard	Flashers and Gates
Meeker Boulevard	Flashers and Gates
Bell Road	Flashers and Gates
Dysart Road	Flashers and Gates
Greenway Road	Flashers and Gates
Thompson Ranch Road	Flashers
111th Avenue	Flashers and Gates
107th Avenue	Flashers and Gates
103rd Avenue	Flashers and Gates
99th Avenue	Flashers and Gates

The BNSF Ennis Spur crosses Grand Avenue near the El Mirage section line. Flashers and gates are provided on Grand Avenue.

3.3 TRAFFIC DATA

3.3.1 Existing Traffic Conditions

Daily traffic volumes along Grand Avenue range from 9,400 west of SR 303L to 37,400 at 107th Avenue. Approximately 15% of the vehicles in the traffic stream are trucks. The percentage of traffic occurring during the peak hour is approximately 8%. Exhibit 3.6 summarizes the average daily traffic volumes for each segment of Grand Avenue between SR 101L and SR 303L. Exhibit 3.7 lists the average daily traffic on the major cross streets intersecting with Grand Avenue. Existing volumes were not available for all of the cross streets, as a consistent traffic counting program does not exist for the study area. Average daily traffic volumes were estimated from peak hour counts for some cross streets. Bell Road carries the highest volume of traffic at 32,800 vehicles. 99th Avenue is the next highest.

Exhibit 3.6
Existing Traffic Volumes Along Grand Avenue

Segment	2000 Average Daily Traffic
West of SR 303L	14,200*
SR 303L to RH Johnson/Sunshine	13,500
RH Johnson to Meeker/Reems	17,600
Meeker to Litchfield	22,100
Litchfield to Bell	20,200
Bell to Dysart	23,300
Dysart to Greenway	27,100
Greenway to El Mirage Road	36,100
El Mirage to Thompson Ranch/Thunderbird	25,400
Thunderbird to 107th Avenue	33,900
107th Avenue to 99th Avenue	37,400
99th Avenue to SR 101L	35,000
East of SR 101L	28,700

*MCDOT December 2001.
Source: ADOT, URS

Exhibit 3.7
Traffic Volumes at Grand Avenue

Segment	2000 Average Daily Traffic	
	Northeast of Grand	Southwest of Grand
SR 303L	NA	4,500
RH Johnson/Sunshine	10,400	7,900
Meeker/Reems	15,900	9,300
Litchfield Road	NA	4,400
Bell Road	32,800	25,600
Dysart Road	13,700	10,200
Greenway Road	11,800	5,700
Thompson Ranch/Thunderbird	NA	8,900
113th Avenue	NA	5,300
111th Avenue	8,500	9,200
107th Avenue	15,300	13,200
103rd Avenue	12,700	9,500
99th Avenue	17,800	10,500

Source: ADOT, MCDOT, and URS
Note: NA = Volumes not available because roadway does not exist on that side of Grand Avenue.

3.3.2 Intersection Level of Service

As defined in the 2000 *Highway Capacity Manual*, level of service is a quality measure describing operational conditions within a traffic stream. Six levels of services (LOS) are defined using letters for each type of roadway facilities. LOS A represents the best operating condition; LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. In urban areas, LOS D is usually acceptable to the public.

The level of service of an arterial street is controlled by the how well vehicles can pass through the signalized intersection along the arterial. Therefore, level of service was calculated at the intersections along Grand Avenue using procedures from the 2000 Highway Capacity Manual. Intersection level of service is based on vehicle delay. Exhibit 3.8 summarizes the level of service at the major intersections along Grand Avenue for the A.M. and P.M. peak hours.

Exhibit 3.8
Year 2000 Intersection Level of Service

Segment	Level of Service	
	A.M. Peak	P.M. Peak
RH Johnson/Sunshine	B*	B
Meeker/Reems	D	D
Litchfield Road	B	B
Bell Road	E	E
Dysart Road	C	C
Greenway Road	C	D
Thompson Ranch/Thunderbird	C*	D
113th Avenue	A	A
111th Avenue	C	C
107th Avenue	D	F
103rd Avenue	D	D
99th Avenue	D	D

*Level of Service is estimated because existing turn movements were not available to calculate LOS.

The only two intersections that operate at an unacceptable level of service are Bell Road and 107th Avenue. The level of service at both intersections would improve to acceptable levels if Grand Avenue had three through lanes in each direction through the intersections.

3.3.3 Accident Summary

The latest three years of accident data along Grand Avenue between SR 101L and SR 303L were obtained from ADOT. The data cover the time period between November 1, 1997, and October 31, 2000. A total of 556 accidents occurred within the project area over the three-year period. Accidents were classified by severity and by type (see Exhibit 3.9). Slightly over half of the accidents (53%) resulted in property damage only. There were 11 fatal accidents. The remaining 45% involved injuries. The top four types of accidents were rear-ends (264 accidents), angle accidents (74 accidents), left-turn accidents (68 accidents), and sideswipes (67 accidents).

Exhibit 3.9
Accidents on Grand Avenue Between
SR 101L and SR 303L
(11-01-97 to 10-31-00)

Type of Accident	Number of Accidents
Rear-End	264
Angle	74
Left Turn	68
Sideswipe	67
Hit Fixed Object	38
Other	16
Overturning	8
Collision with Pedestrian	7
U-Turn	5
Head-On	4
Backing	4
Collision with Bicycle	1
Total	**556**
Accident Severity	**Number of Accidents**
Property Damage Only	294
Injury	251
Fatal	11
Total	**556**

There were no accidents involving a train during the three years that accident data were compiled. Since the collection of data, a fatal accident involving a train occurred at Greenway Road.

Accident rates were also calculated. The accident rate on Grand Avenue between SR 101L and SR 303L is 1.7 accidents per million vehicle miles of travel (VMT). This rate is significantly lower than the City of Phoenix citywide average of 5.0 accidents per million VMT. The percentage of total accidents involving pedestrians (1.25%) and bicycles (0.2%) along the Grand Avenue corridor are similar to the average for urban areas in Arizona in 1999 (pedestrians [1.4%] and bicycles [2.1%]).

The fatal crash rate for the corridor is 3.4 fatal accidents per 100 million VMT. This is higher than the State of Arizona rate of 1.9 fatal accidents per 100 million VMT.

3.4 INTELLIGENT TRANSPORTATION SYSTEMS

MAG recently completed a 12-month study that produced a detailed plan for deploying Intelligent Transportation System (ITS) projects and programs throughout the region over the next 20 years. This update revised the original ITS Strategic Plan completed in 1995. Key elements of the Update include:

- ITS solutions to be deployed over the next 20 years to meet regional transportation needs.
- A System Architecture to show how all of the systems, subsystems and field elements work together.
- A Telecommunications Plan to support the candidate technologies (many of which are already in place on key freeways and arterial roadways).
- An Implementation Plan for short-, medium- and long-range ITS deployment.
- Operational and Implementation Strategies to outline agency roles, responsibilities and resources needed to support long-term ITS operations.

Grand Avenue from Van Buren Street to Bell Road was previously identified in the AZTech Model Deployment Initiative as one of 24 regional SMART corridors. These corridors are key arterial links that pass through multiple jurisdictions. ITS technologies to be implemented in SMART corridors include traffic detection, closed circuit television cameras and variable message signs. Traffic signals are coordinated across jurisdictional boundaries and freeway interchange signals are coordinated with arterial street signal systems. Grand Avenue between SR 101L and Bell Road, as well as the portion southeast of the study area, is a Phase I corridor, meaning that ITS implementation has begun. Bell Road to the east of Grand Avenue is also a Phase I ITS corridor. Signal coordination has been implemented along Bell Road. Currently, the signals along Grand Avenue are not coordinated.

The following planned projects identified in the MAG ITS Strategic Plan are likely to affect the study corridor:

- Install Freeway Management System (FMS) components on SR 101L, Grand Avenue to I-17 (mid-term project, 2007-2011).
- Upgrade components on existing SMART corridors and add additional components as needed (long-term project, 2012-2021).
- Improve signal coordination along SMART corridors (long-term project, 2012-2021).
- Install Freeway Management System (FMS) components on SR 101L, I-10 to Grand Avenue (mid-term project, 2007-2011).

3.5 PUBLIC TRANSIT

3.5.1 Fixed Route Services

The Regional Public Transportation Authority (RPTA) provides limited public bus service within the project area. The only route provided is Route 106, which begins at 105th Avenue and Santa Fe Drive (adjacent to Boswell Memorial Hospital), travels west to 111th Avenue, south to Peoria Avenue and then east to Metrocenter Transit Center. In downtown Peoria, it intersects the Yellow Line, which travels down Grand Avenue through downtown Glendale to downtown Phoenix and Tempe. Route 106 operates weekdays every 30 to 90 minutes from 4:30 A.M. to 9:00 P.M. The November 2000 Valley Metro Ridership Report shows 108 daily boardings in Sun City and 194 in Peoria. There is no express bus service within the area.

3.5.2 Demand Responsive Service

Demand responsive (also known as paratransit) service is characterized by the lack of a pre-determined route or schedule. Paratransit service is similar to taxi service in that passengers may board at any origin and be transported to any destination, as long as the origin and destination are within a specified service area. Unlike taxi riders, however, paratransit users may have to share their trip with other passengers who have a similar origin or destination.

Exhibit 3.10 lists paratransit systems operating in the study corridor. These services comply with the requirements of the Americans with Disabilities Act (ADA) to provide paratransit service complementary to local bus service for persons certified as ADA-eligible. They also serve non-certified elderly and disabled persons and, in some cases, the general public. Service typically operates from 8 to 12 hours a day.

Unlike bus routes, these paratransit systems typically do not cross municipal boundaries. An exception is Maricopa County Special Transportation Services, operated by the American Red Cross, which emphasizes medical trips and trips to senior centers.

Exhibit 3.10
Paratransit Systems Serving Grand Avenue Corridor

System	Eligibility	Vehicles	Days of Service	No. of Annual Boardings
El Mirage Dial-a-Ride	General Public	Not Available	Mon- Fri	3,318
Maricopa County/ American Red Cross	Elderly, Disabled, Low Income	70	Mon-Fri	132,490
Peoria Dial-a-Ride	General Public	9	Mon-Fri	30,395
Sun Cities Area Transit*	General Public	15	Daily**	59,777
Surprise Dial-a-Ride	General Public	4	Mon-Fri	7,261

* Serves the Sun City, Sun City West and Youngtown areas.
**ADA service weekdays only.

Sources: Valley Metro Short Range Transit Report for Fiscal Years 2001 through 2005; March 2001 BusBook; Regional Dial-a-Ride Guide.

3.5.3 Interstate Bus Service

Several Greyhound buses per day on the Phoenix-Las Vegas and Phoenix-Los Angeles routes serve Youngtown. K-T Services operates several daily Phoenix-Las Vegas trips that stop at the same location, where passengers can connect with local bus route 106. The buses use Grand Avenue on their way to and from Phoenix.

3.5.4 Rail

The BNSF Railroad Phoenix Division is a predominantly single-track line that traverses the project area parallel to Grand Avenue. This line is an important freight route connecting Phoenix with the BNSF Railroad transcontinental mainline via the Peavine route and with southern California via the Arizona & California Railroad. The railroad bridges the Agua Fria River, New River and SR 101L. A spur track leaves the mainline near El Mirage Road and proceeds generally southwest to 143rd/Olive Avenue, where it splits in two, with a western branch serving Olive Avenue and Cotton Lane, and an eastern branch to Luke AFB.

The BNSF Railroad mainline is a very active facility that plays a key role in the Phoenix area's freight transportation system. The line currently carries approximately 13 million tons of freight per year on ten trains per day between Wickenburg and Glendale. Although specific traffic forecasts are not available, freight volumes carried by this line are expected to increase as Maricopa County continues its growth. The Grand Avenue route provides the only rail connection with the BNSF Railroad transcontinental mainline through Flagstaff, which carries approximately 140 million tons per year. The line also connects with the Union Pacific Railroad

in central Phoenix, although more than 95% of Grand Avenue trains originate or terminate in the Phoenix market.

No rail passenger service exists within the study area or elsewhere in the Phoenix metropolitan area. ADOT has studied both commuter and long distance (Phoenix-Grand Canyon) passenger service in the Grand Avenue corridor. Passenger rail service along the BNSF Railroad tracks would face many challenges. The single-track route, heavy freight traffic and busy grade crossings at intersections would make passenger service difficult to operate in this corridor. The ongoing MAG High Capacity Transit Study and discussions with BNSF may improve opportunities to provide transit service along the corridor.

The RPTA completed a Major Investment Study of a proposed light rail line from the Central/Camelback area in Phoenix to downtown Glendale and Metrocenter. The line would be an extension of a starter route from 19th Avenue and Bethany Home Road to Mesa, and eventually to Glendale and Metrocenter. In addition, MAG prepared a Fixed Guideway System Plan to evaluate potential high-speed transit corridors throughout the Phoenix metropolitan area. MAG and RPTA have estimated that the current bus system would have to be at least doubled to support a viable light rail system. Such an expansion of the existing transit system would require development of a dedicated funding source.

3.5.5 Intermodal Facilities

Intermodal facilities are places where persons or goods can transfer or be transferred between modes of transportation. Passenger facilities include transit centers, park-and-ride lots, airports, intercity bus terminals and rail passenger stations. Freight facilities include airports, rail freight terminals, truck terminals, and pipeline terminals.

The MAG Intermodal Management System (April 1995) identifies one intermodal freight facility within the study area. The El Mirage Auto Distribution Facility, owned and operated by the BNSF Railroad, is located east of Grand Avenue near Greenway Road. The automobiles handled by this facility are significant only as freight carried by trains and trucks, not as transportation vehicles.

The MAG Intermodal Management System lists the following study area roadways as intermodal access routes for the Phoenix region:

- Grand Avenue
- SR 101L
- SR 303L
- Bell Road from SR 101L to SR 303L

3.5.6 Park-and-Ride Lots

The only facility within the corridor designated as a park-and-ride lot is a section of the parking lot at Sundome Center for the Performing Arts located at 19402 RH Johnson Boulevard in Sun City West. The lot currently has no bus service but 25 parking spaces are open for carpools and vanpools. The recently completed MAG Park-and-Ride Site Selection Study recommended a park-and-ride lot for the southwest corner of Dysart Road and Bell Road. This park-and-ride location was added to the 2001 update of the MAG Long Range Transportation Plan.

3.5.7 Programmed Transit Capital Improvements

Exhibit 3.11 lists transit capital improvements programmed by jurisdictions within the corridor for fiscal years 2001 through 2005. Most projects are funded by a combination of federal and local sources. The new buses scheduled for purchase will replace existing older buses. No expansion of services or increase in service frequency is programmed.

Exhibit 3.11
Programmed Transit Improvements, 2001-2005

Jurisdiction	Year	Cost	Description
Peoria	2001	$ 130,000	Purchase 2 medium duty buses (replacement)
RPTA	2001	$ 195,000	Purchase 3 buses for Sun City (replacement)
Peoria	2002	$ 65,000	Purchase 1 medium duty bus
Peoria	2003	$ 195,000	Purchase 3 medium duty buses (replacement)
Peoria	2004	$ 260,000	Purchase 4 medium duty buses (replacement)
RPTA	2002	$ 195,000	Purchase 3 buses for Sun City (replacement)
RPTA	2003	$ 195,000	Purchase 3 buses for Sun City (2 replacements and 1 new)
RPTA	2004	$ 195,000	Purchase 3 buses for Sun City (replacement)
RPTA	2005	$ 210,000	Purchase 3 buses for Sun City (replacement)
Total Cost		**$1,640,000**	

Source: MAG TIP for Fiscal Years 2001 through 2005.

3.6 ALTERNATIVE MODES OF TRAVEL

There are few bicycle facilities within the study area. Bike lanes are located on El Mirage Road between Thunderbird Road and Santa Fe Lane. Between Greenway Road and Waddell Road, bike routes are designated along Dysart Road and 133rd Avenue.

Planned bicycle facilities in the MAG Long Range Transportation Plan include bicycle facilities along Grand Avenue, Bell Road, 99th Avenue and Litchfield Road. In addition, the New River, Agua Fria River, and Beardsley Canal are shown as potential off-road bikeways. The type of facility in not defined. Additional bike lanes are planned within the corridor as shown in the City

of Surprise 2000 General Plan: Reems Road, Greenway Road, Waddell Road, Dysart Road, Mountain View Road and El Mirage Road.

The MCDOT Bicycle System Plan includes the following facilities:

- Waddell Road, Cotton Lane to Dysart Road
- SR 303L Access Road, Waddell Road to Lake Pleasant Road
- 99th Avenue, Olive Avenue to Bell Road
- 103rd Avenue, Grand Avenue to Boswell Boulevard
- El Mirage Road, Bell Road to Deer Valley Road
- Thunderbird Road, 99th Avenue to Peoria City Limits

The only pedestrian facilities within the corridor include some sidewalks along the southwest side of Grand Avenue. Sidewalks are present along new development (shopping centers) in Surprise, across the bridge over the Agua Fria River, through Youngtown, near 103rd Avenue and across the bridges over the New River and SR 101L. Sidewalks are also present along the frontage road in El Mirage. Evaluation of existing pedestrian facilities and needs is discussed in Chapter 7, Alternative Mode Needs.

MAG completed a New River and Lower Agua Fria River Multi-Modal Corridor Study. The study recommended a 42-mile non-motorized system of urban and rural trails along the New River and Lower Agua Fria River. The trails will be designed for pedestrians, hikers, bicyclists, and equestrian activities. Local jurisdictions will be responsible for the design and implementation of each segment of the trails. The Flood Control District of Maricopa County prepared the Agua Fria Watercourse Master Plan, which includes a trail along the Agua Fria River.

Golf carts are another mode of travel widely used within the corridor. Residents of the adjacent retirement communities use golf carts along the arterial streets adjacent to the Grand Avenue corridor. Although golf carts are not allowed on Grand Avenue, they are frequently used to cross Grand Avenue at signalized intersections throughout the corridor.

4.0 ENVIRONMENTAL ISSUES AND TITLE VI/ ENVIRONMENTAL JUSTICE

4.1 INTRODUCTION

The goal of this chapter is to identify environmental issues that may create "fatal flaws" for the proposed improvements in the corridor. This chapter will also address environmental justice and Title VI requirements for the study. Environmental features that can affect transportation-related improvements that were evaluated include:

- Physical constraints
- Sensitive (threatened or endangered) plant and animal species
- Cultural resources (either historical or prehistoric)
- Section 4(f) considerations (parkland and other public lands or facilities)
- Floodplains
- Air quality
- Noise receptors

Title VI and Environmental Justice population characteristics evaluated as part of the corridor study include:

- Race (percent non-white)
- Age (percent age 60 and older)
- Mobility disability (prevalence of persons with mobility or self-care limitations)
- Low income (as defined by federal poverty guidelines)
- Female head of households (percent single female parent)

4.2 ENVIRONMENTAL FEATURES

4.2.1 Physical Constraints

For purposes of this study, environmental constraints are defined as natural or man-made features that could constrain future transportation facilities or improvements. As Exhibit 4.1 illustrates, waterways including the New and Agua Fria rivers are the major natural constraints in the Northwest Valley. Only Grand Avenue, Bell Road, and Olive Avenue provide bridge crossings over both rivers within the study area. Man-made constraints include development features that preclude continuation of the roadway grid or roadway system improvements.

Hospitals and fire stations provide critical emergency services that must not be interrupted. Exhibit 4.1 shows the location of hospitals and fire stations. Two hospitals within the study area include Boswell Memorial Hospital at 107th Avenue and Del E. Webb Memorial Hospital at Meeker Boulevard. Both hospitals are located on the northeast side of Grand. The roadway network must provide emergency vehicle access to all residential and commercial land uses; therefore, roadway standards must reflect the needs of these vehicles. The Burlington Northern Santa Fe Railroad (BNSF) paralleling Grand Avenue can be considered a physical constraint.

Exhibit 4.1 also shows the location of industrial sites and potential hazardous material sites at locations with underground storage tanks. Clean-up of these sites would be required if impacted by roadway improvements.

4.2.2 Sensitive Plant and Animal Species

The *Grand Avenue Corridor Study Environmental Assessment*, 1986 noted that according to the U.S. Fish and Wildlife Service, Arizona Game and Fish Department and Arizona Native Plant Law, no species (wildlife or vegetation) of concern were known to exist in the corridor. However, these agencies will need to be contacted during subsequent environmental assessments if major projects are proposed.

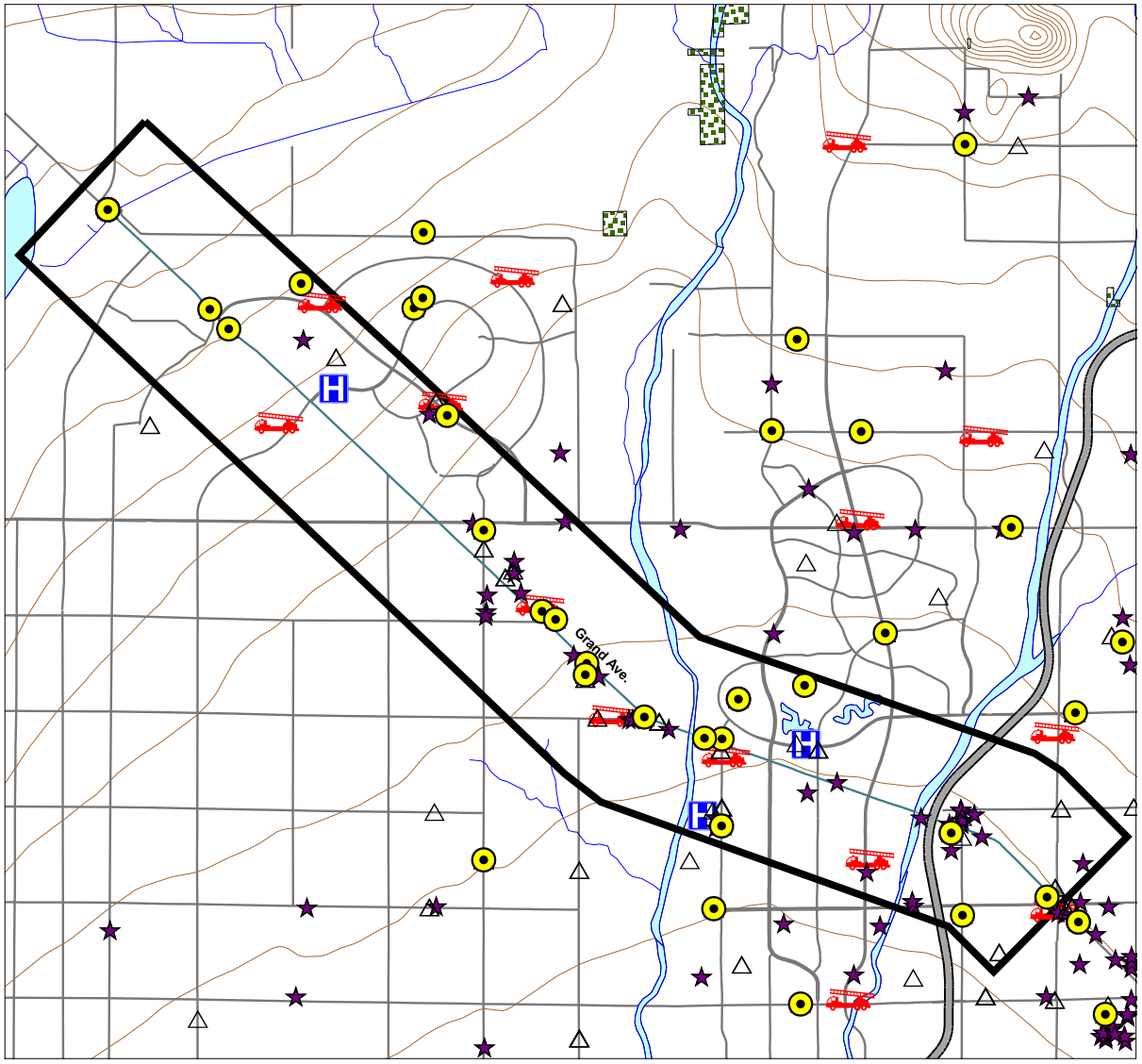
4.2.3 Cultural Resources

A survey of the cultural resources in the corridor was conducted in March 1986. Results from the survey are documented in the Grand Avenue Corridor Cultural Resource Survey, June 1986.

There were no properties currently listed or previously determined to be eligible for listing on the National Register. One property and one structure were identified as potentially eligible for listing on the National Register. The property was the Maricopa County Municipal Water Conservation District #1 Shop Building located at Milepost 140 on Grand Avenue. The buildings are no longer on the property. The structure potentially eligible is the railroad bridge over the Agua Fria River.

The National Register of Historic Places was established by the National Historic Preservation Act of 1966, as amended in 1980. It is the nation's official listing of prehistoric and historic properties worthy of preservation. It affords recognition and protection for districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. The Register serves as a planning tool and as a means of identifying sites and districts that are of special significance to a community and worthy of preservation. A review of the National Register Information System found no listings within the Grand Avenue Northwest Corridor.

Exhibit 4.1. Environmental Features and Physical Constraints



Grand Avenue Northwest Corridor Study

Features and Constraints

- Underground Storage Tanks
- Leaking Underground Storage Tanks
- Industrial Sites
- Hospitals
- Fire Stations
- BLM Land
- Landform Contours

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water Bodies
- Rivers/Washes

N

1 0 1 2 3 Miles

Source: Northwest Valley Transportation Study 1999; MCDOT GIS Database

MARICOPA ASSOCIATION of GOVERNMENTS

The Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Collections are collections of documentary measured drawings, photographs and written historical and architectural information for over 31,000 structures and sites in the United States. The U.S. Department of the Interior administers the surveys and creates the records, which are transferred to the Library of Congress. Architectural and engineering structures and sites of almost every type, including residential, commercial, public, religious, military and industrial categories, have been recorded in these collections. A review of the on-line geographic index found no listings within the Grand Avenue Northwest Corridor.

4.2.4 Section 4(f) Properties

Properties identified under section 4(f) of the Department of Transportation Act of 1966 are protected by the FHWA from being used in roadway projects. Properties could include public parks, and schools allowing public access to sport/playground facilities. Potential 4(f) properties within the corridor include golf courses and community parks along both sides of Grand Avenue as part of Sun City, Sun City West, and Sun City Grand. Schools are located on the southeast corner of Dysart Road and Greenway Road and the southwest corner of Thunderbird Road and El Mirage Road. A cemetery, Floral Lakes Memorial Gardens, is located south of Grand Avenue just east of Greenway Road. Five public parks are located within the corridor: Bicentennial Park, Gaines Park, Three Star Park, Bill Gentry Park and Maricopa Lakes Park.

4.2.5 Floodplains

Existing drainage conditions within the corridor can be separated into four sections along Grand Avenue:

Beardsley Canal to the Agua Fria River

Drainage flow in this area is to the southeast, generally parallel to Grand Avenue. The McMiken Dam intercepts flows west of the study corridor. The BNSF railroad tracks protect Grand Avenue along the north side throughout the segment. Sun City West is also located northeast of the tracks and has a self-contained drainage system. An unpaved drainage ditch runs parallel to Grand Avenue on the northeast side between SR 303L and Dysart Road. A paved drainage ditch runs parallel to Grand Avenue on the southwest side between Dysart Road and Thunderbird Road, where it enters a pipe and outfalls at the Agua Fria River.

Agua Fria River

The most recent floodplain delineation of the Agua Fria River was obtained from the *Agua Fria River Floodplain Delineation Re-Study* in 1996. The 100-year floodplain boundary will be shown on any nearby proposed improvement projects' layouts. Projects are not restricted from

being located in the floodplain; however, additional considerations will be required during design of the projects.

Agua Fria River to the New River

Sun City lies to the northeast of Grand Avenue and has a system of channels in place to control drainage. Flow is from north to south. Two major drainage channels protect Grand Avenue; one draining west from 107th Avenue to the Agua Fria River and the other draining east from 107th Avenue to the New River. Both channels are located on the northeast side of the BNSF railroad tracks. The railroad tracks are several feet higher than Grand Avenue and provide additional protection to Grand Avenue.

New River

The completion of the New River Dam reduced the floodplain area at Grand Avenue to containment within the existing railroad and roadway bridge openings.

4.2.6 Air Quality

The U.S. Environmental Protection Agency (EPA) maintains a national air quality monitoring network to assess the presence of principal air pollutants affecting the ambient (general) air quality in major metropolitan areas throughout the nation. Pollutants considered to have a potentially significant effect on human health include the following:

- Carbon monoxide (CO) – an invisible, odorless gas generated when motor fuel is not burned completely. Sufficiently high concentrations cause unconsciousness and death. CO tends to build up and persist in "hot spots" when high emissions levels occur in a localized area.
- Ozone – is a secondary pollutant created by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of heat and light. The burning of fossil fuels such as gasoline, diesel fuel and wood are major sources of NO_x and VOCs. Ozone is created when sunlight and heat react with nitrous oxides and chemicals called volatile organic compounds.
- PM-10 – small particles that are less than 10 microns in diameter and that are emitted into the air from vehicles (particularly diesel trucks), combustion, construction work and other activities that raise dust. Natural forces such as dust storms can also raise ambient PM-10 levels.

The principal environmental concerns affecting transportation in the Northwest Valley are the air quality non-attainment areas for ozone, carbon monoxide and PM-10. The entire study area falls within a regional non-attainment area for ozone, carbon monoxide and PM-10. Projects

increasing roadway capacity recommended in the Grand Avenue Northwest Corridor Study will have to be evaluated to determine if they conform to local air quality improvement plans.

4.2.7 Noise Receptors

Many residential subdivision abut up to Grand Avenue on the southwest side of the roadway. Any major roadway improvement will need to be evaluated for noise impacts during the preliminary design and environmental assessment stage of the project to determine if noise mitigation measures are needed. The section 4(f) properties identified above will be considered noise receptors and impacts to these properties will also have to be evaluated. Projects will be evaluated against ADOT's Noise Abatement Policy.

4.3 TITLE VI AND ENVIRONMENTAL JUSTICE POPULATIONS

Title VI of the Civil Rights Act of 1964 and related statutes assure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, religion, age, gender or disability. Executive Order 12898 on Environmental Justice directs that programs, policies and activities not have a disproportionately large and adverse human health and environmental effect on minority and low-income populations.

In recent years there has been increased attention and focus on ensuring equity, environmental justice and Title VI compliance in the delivery of government programs. Recipients of federal assistance for transportation-related projects are now required to assure compliance with all civil rights standards applicable to the specified transportation-related projects, as they relate to Title VI of the Civil Rights Act of 1964, as amended. Title VI of the 1964 Civil Rights Act, Section 601, states: "No person in the United States shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

To be consistent with the requirements of Title VI and environmental justice, the demographic characteristics of the study area population were examined to determine whether various specified populations would be disproportionately affected negatively by or discriminated against by the overall set of projects to be recommended in the Grand Avenue Northwest Corridor Study. Projects developed for the Grand Avenue Northwest Corridor Study could be funded from federal sources. Therefore, these recommended projects are conceived and presented in a manner to assure that they are compliant with Title VI requirements in the event that they become improvement projects that use a federally funded revenue source. Specific construction projects will be analyzed for potential Title VI impacts as part of the environmental analysis phase, when they become programmed in future years. The following variables were considered:

- Race (percent non-white)
- Age (percent age 60 and older)
- Mobility disability (prevalence of persons with mobility or self-care limitations)
- Low income (as defined by federal poverty guidelines)
- Female head of households (percent single female parent)

Exhibits 4.2 through 4.6 map the proportion of the population belonging to each of these groups by census tract. The maps are based on 1995 Special Census data collected for Maricopa County, except for population with a mobility disability (Exhibit 4.4) which is based on the 1990 Census.

The minority population describes the ethnic background for each person within the population and includes individuals whom are African American, Hispanic, Asian/Pacific Islander, Native American or Alaskan Native. Exhibit 4.2 shows the percent of non-White residents by census tract. The percentage ranges from less than 5% in some areas, especially the Sun Cities, to more than 40% in a few tracts in El Mirage. According to the *MAG 1995 Special Census Summary Table 2E*, 28% of the total population in Maricopa County was classified as minority.

Elderly refers to individuals 60 years of age and older. Exhibit 4.3 illustrates the percent of the population considered elderly. As one would expect, this percentage is highest (over 60%) in the established retirement communities of Sun City, Sun City West and Sun City Grand. The more sparsely populated areas north and west of the study area also have a relatively high proportion of seniors, although this may change as these areas experience higher-intensity development. A total of 12.6% of Maricopa County individuals are elderly.

Mobility Disability has been defined as the populations of persons, 16 years of age and older, who have been identified as having a mobility limitation due to a health condition. These health conditions are further defined as having lasted six or more months and have made it difficult to travel outside the home unassisted. Mobility Disability data were obtained from the 1990 Census database. Exhibit 4.4 shows a high percent of residents in the corridor with a disability. The highest proportions tend to exist in and near Sun City and Sun City Grand areas. Not surprisingly, there is a noticeable relationship between advanced age (Exhibit 4.3) and disability (Exhibit 4.4). A total of 6% of Maricopa County individuals have a mobility disability.

Low income populations are defined as households that fall below the federal poverty guidelines. To correspond to 1995 Census data, 1995 federal poverty guidelines were used to determine low income populations. Poverty status in 1995 was defined as households earning an annual income that is equal to or less than the following:

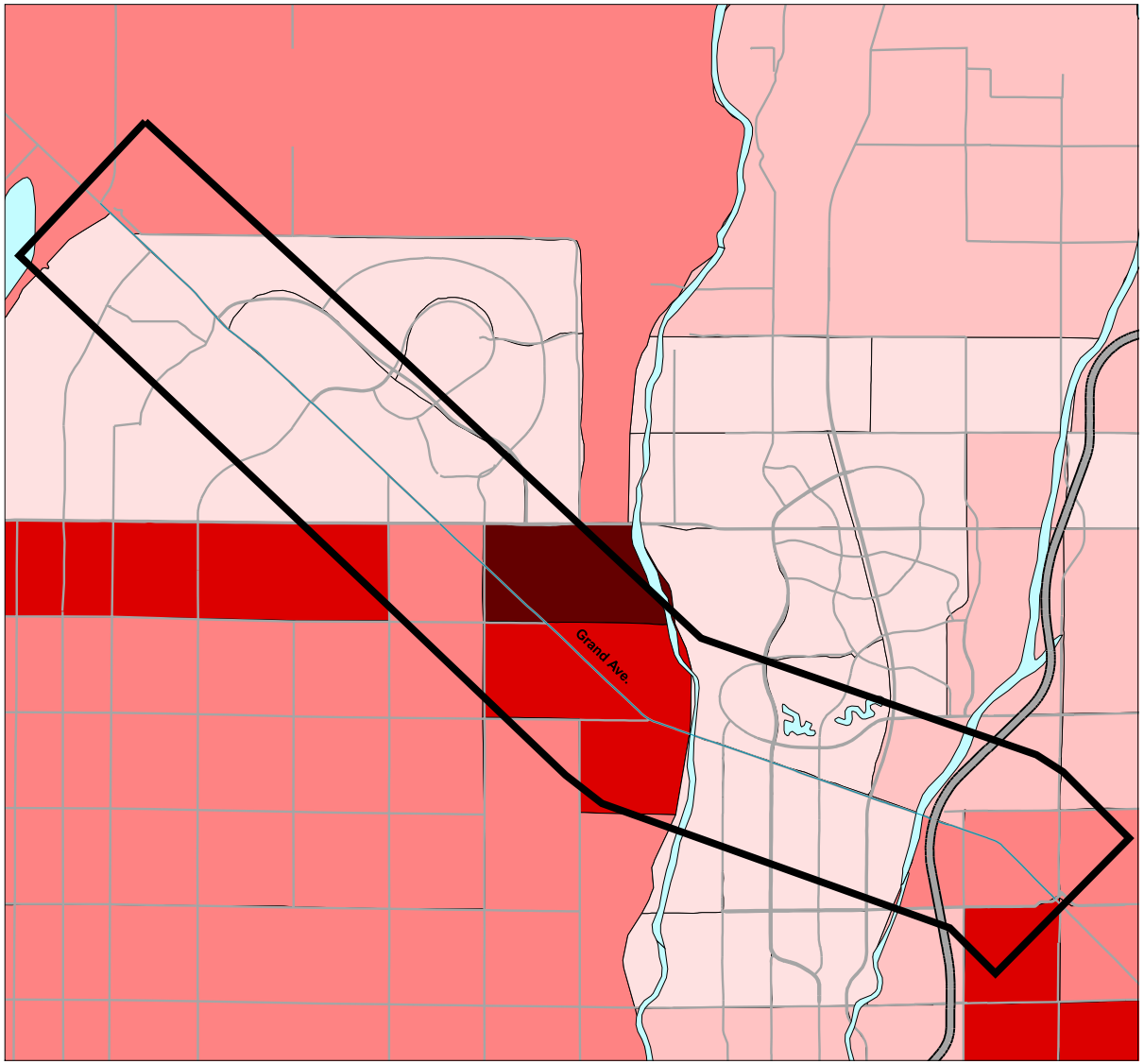
- One-person household earning $7,500 or less
- Two-person household earning $10,000 or less
- Three-person household earning $12,500 or less
- Four or more person household earning $15,000 or less
  (Source: MAG 1995 Special Census Summary Tables, Appendix A-2)

The percentage of households identified as "low income" is shown in Exhibit 4.5 and ranges from under 3% in some census tracts to more than 25% in the older portion of El Mirage. A total of 10% of the households in Maricopa County are considered low income households.

A female head of household is defined as a household that is maintained by a single female parent. Exhibit 4.6 shows the percentage of female head of households for the corridor. Female head of household populations are highest in sections of El Mirage with 15% to 20% of households being maintained by a single female parent. A total of 11.6% of the households in Maricopa County are maintained by a single female parent.

As Exhibits 4.2 through 4.5 illustrate, the Grand Avenue corridor has high percentages of the populations protected under Title VI. As projects are developed and evaluated during this corridor study, impacts to these populations will be evaluated. The evaluation will ensure that these populations are not disproportionately affected negatively by or discriminated against by the overall set of projects to be recommended in the Grand Avenue Northwest Corridor Study. It is more likely that transportation improvement projects within the corridor will serve and benefit the residents of the corridor regardless of their census population classification.

Exhibit 4.2. Population by Race



Grand Avenue Northwest Corridor Study

Percent Non-White by Census Tract (1995)

- 0 - 5
- >5 - 12 %
- >12 - 25 %
- >25 - 40 %
- >40 %

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water

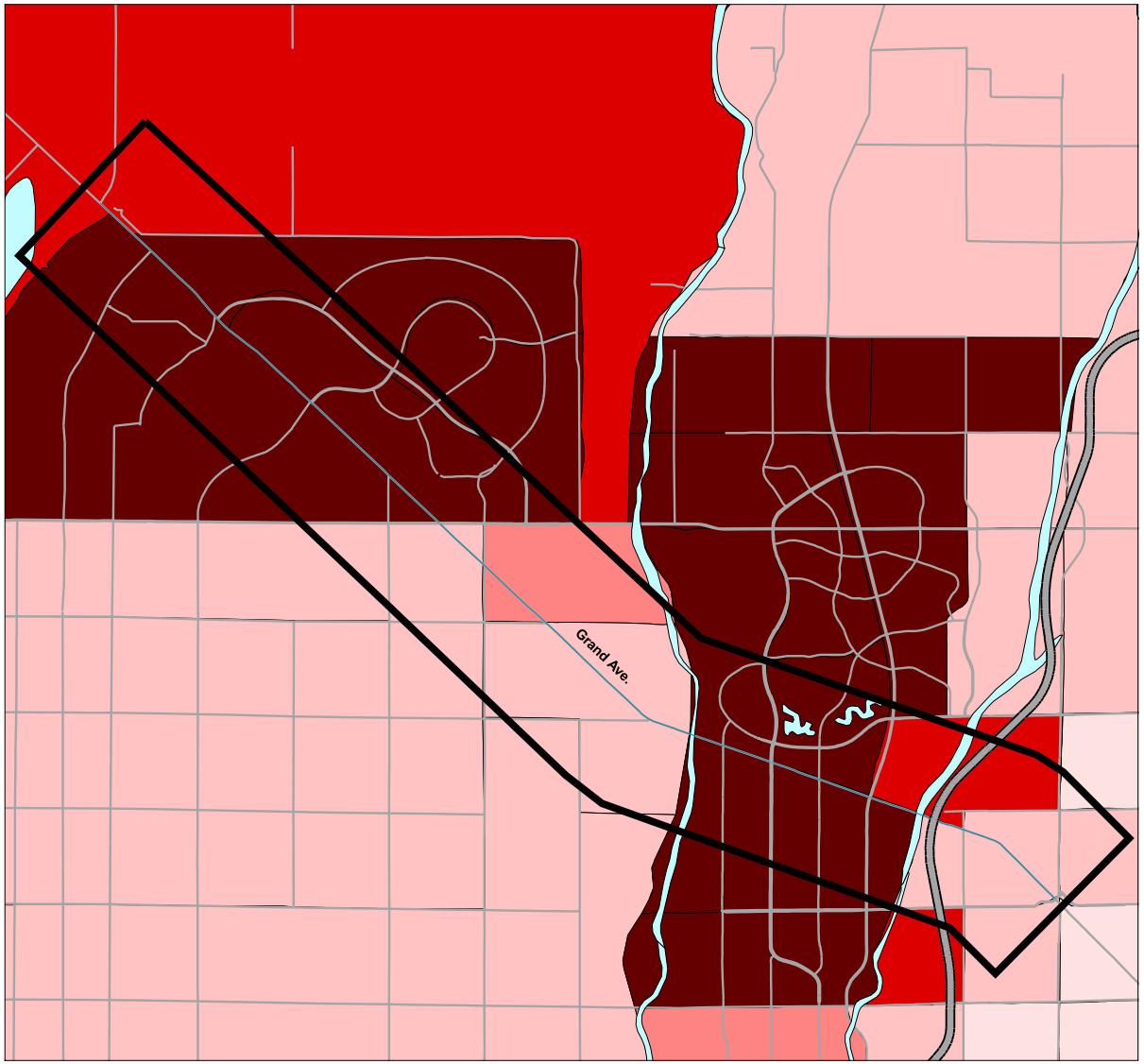
N

1 0 1 2 3 Miles

Source: MAG 1995 Special Census for Maricopa County Summary Tables, September 1997

MARICOPA ASSOCIATION of GOVERNMENTS

Exhibit 4.3. Population by Age



Grand Avenue Northwest Corridor Study

Percent Age 60 and Over by Census Tract (1995)

- 0 - 7 %
- >7 - 15 %
- >15 - 30 %
- >30 - 60 %
- >60 %

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water

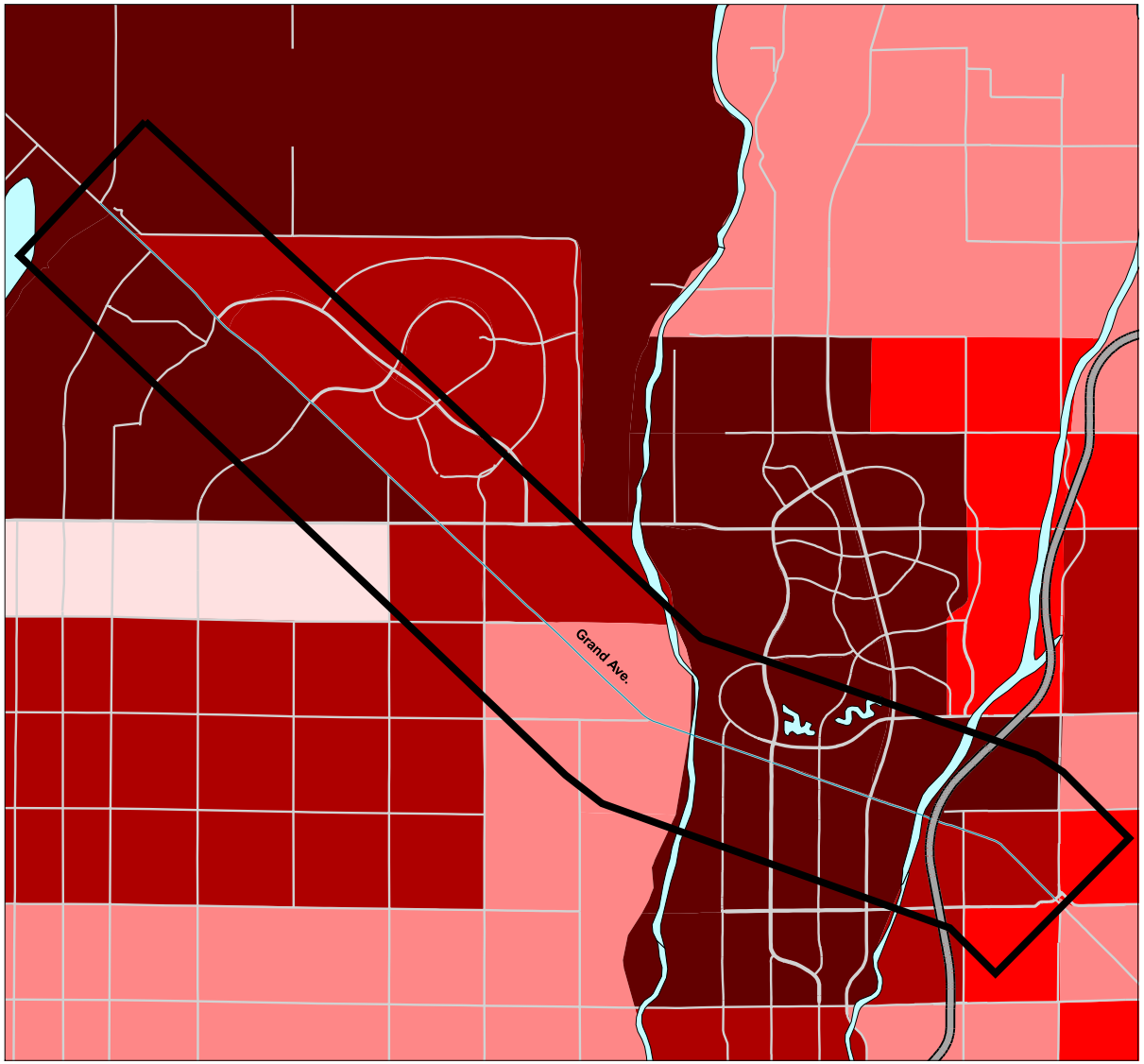
N

1 0 1 2 3 Miles

Source: MAG 1995 Special Census for Maricopa County Summary Tables, September 1997

MARICOPA ASSOCIATION of GOVERNMENTS

Exhibit 4.4. Population by Mobility Disability



Grand Avenue Northwest Corridor Study

Percent of Mobility Disability by Census Tract (1990)

- 0 - 5 %
- >5 - 10 %
- >10 - 15 %
- >15 - 20 %
- >20 - 50 %

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water

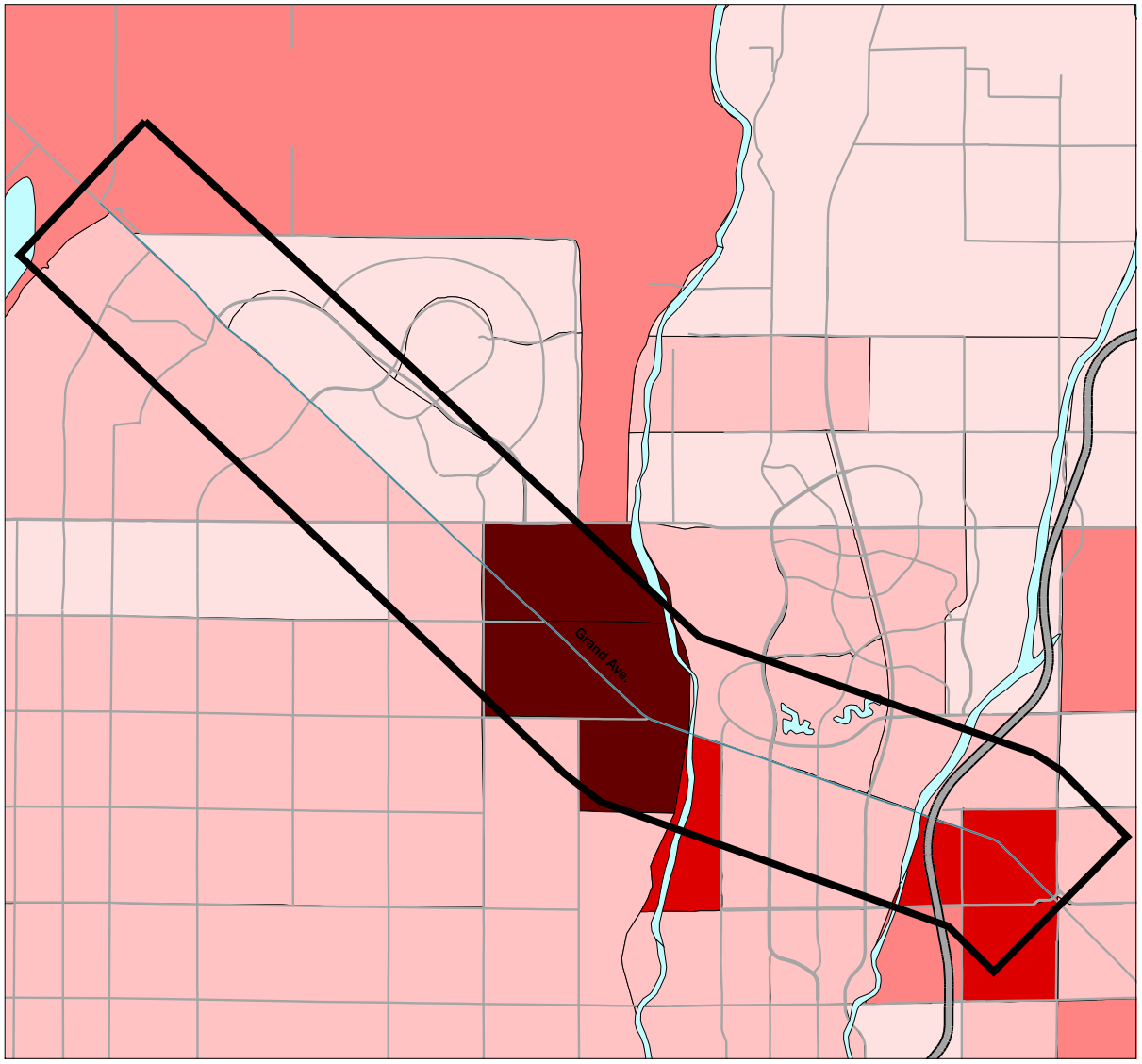
N

1 0 1 2 3 Miles

Source: 1990 Census

MARICOPA ASSOCIATION of GOVERNMENTS

Exhibit 4.5. Low Income Population



Grand Avenue Northwest Corridor Study

Percent Low Income by Census Tract (1995)

- 0 - 3 %
- >3 - 10 %
- >10 - 15 %
- >15 - 25 %
- >25 %

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water

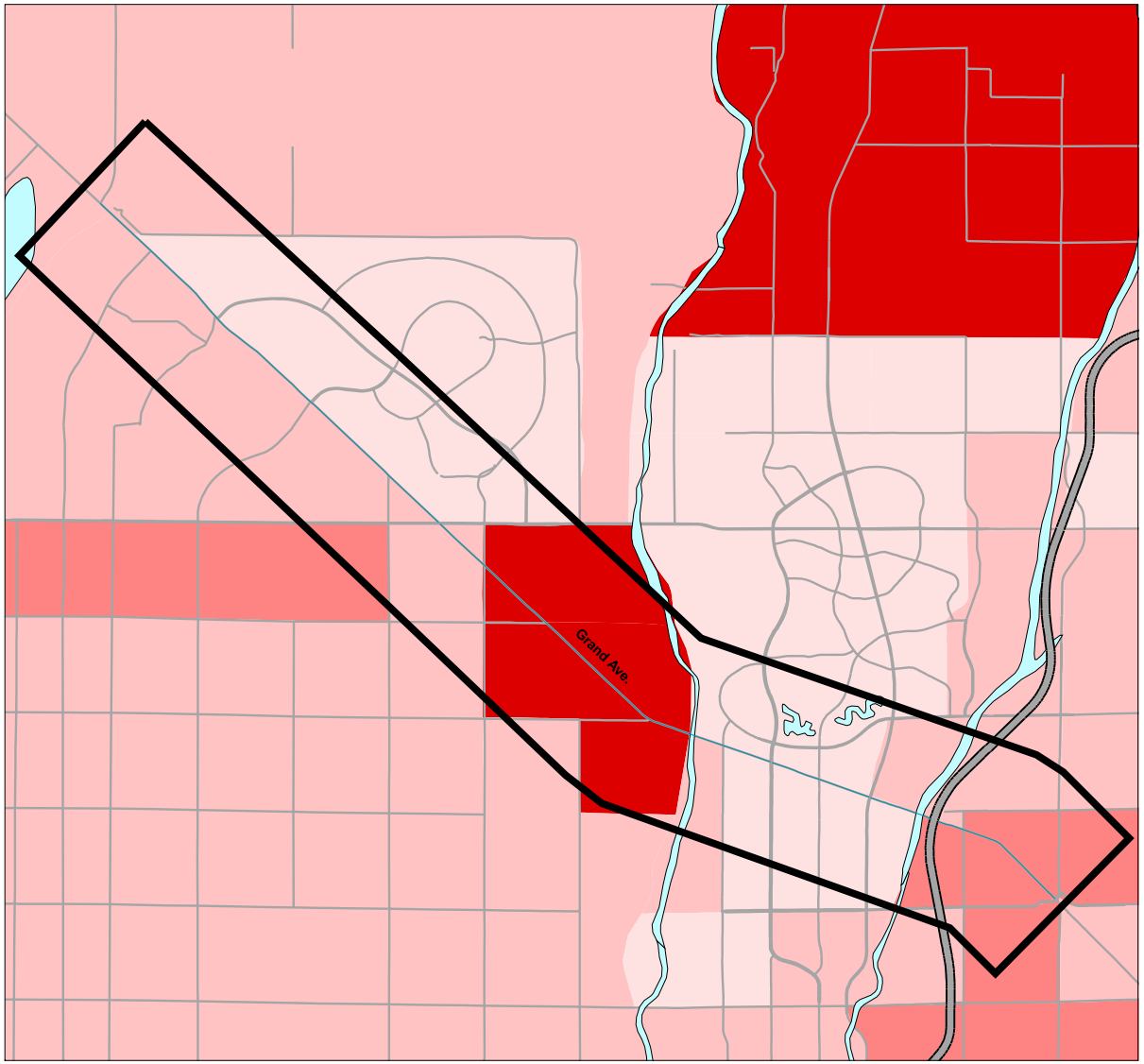
N

1 0 1 2 3 Miles

Source: MAG 1995 Special Census for Maricopa County Summary Tables, September 1997

MARICOPA ASSOCIATION of GOVERNMENTS

Exhibit 4.6. Female Head of Household



Grand Avenue Northwest Corridor Study

Percent Female Head of Household by Census Tract (1995)

- 0 - 5 %
- >5 - 10 %
- >10 - 15 %
- >15 - 20 %
- >20 %

Base Map Features

- Study Area Boundary
- Freeways
- Streets
- Water

N

1 0 1 2 3 Miles

Source: MAG 1995 Special Census for Maricopa County Summary Tables, September 1997

MARICOPA ASSOCIATION of GOVERNMENTS

5.0 MAJOR ISSUES, GOALS AND POLICIES

5.1 INTRODUCTION

This chapter presents the major issues within the corridor and the goals and objectives developed for this Grand Avenue Northwest Corridor Study. The goals and objectives were used as a basis for evaluating potential transportation improvements for the corridor.

A wide range of issues concerning the Grand Avenue corridor were identified during the study. An initial list of issues was developed during the proposal phase of the study. A list of 18 issues was included in the request for proposal from MAG. Additional issues were specified in two letters to MAG from member agencies and community representatives during the scoping phase of the study. The letters were included in Working Paper 5 and are on file.

To initiate the public involvement process, an agency/community forum was held on July 28, 2000, and a public meeting was held on September 27, 2000. At these meetings, the general public and agency and community representatives had opportunities to provide input into identifying issues. Agency and community representatives and the public were generally in agreement on the list of issues identified for the study.

5.2 STUDY PARAMETERS

Several of the issues identified should be considered more as study parameters or things to consider when developing the options. These parameters also include concerns about how the study is conducted. The parameters developed for the study establish minimum guidelines that the study must follow. The parameters also establish criteria that investment options must meet to be considered in the MAG long-range transportation plan and transportation improvement programs. The study parameters are summarized below.

A. Provide Public Involvement Opportunities

Public and agency involvement on all transportation projects is of utmost importance to MAG. A public involvement plan was developed for this study to ensure that opportunities for public input exist during this corridor study. Public involvement will help develop consensus among stakeholders that the study was thorough, that their concerns and needs were addressed, that the Study provides vision for the Corridor, and that the study results in concepts for improvements in the Corridor that can be implemented. MAG and the project team seek to provide minority communities and low income communities access to public information and an opportunity for public participation. In addition, products completed as part of this project were made available to the public.

B. Conform to Title VI and Environmental Justice Regulations

From its inception, the MAG has been committed to ensuring that its transportation plans and programs meet the needs of the entire regional community, including the Valley's many different socioeconomic and ethnic groups. MAG embraces the principles of Title VI of the Civil Rights Act of 1964, which provides that "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." MAG also adheres to federal and state laws that prohibit discrimination on the basis of religion, age, gender, handicap or disability.

MAG is further committed to the principles of "environmental justice," by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations.

The transportation investment options developed through this study conform to the principles of Title VI and Environmental Justice. There is also a commitment to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.

C. Develop Projects that Accommodate Design Traffic Volumes

Any investment option for Grand Avenue should be able to handle traffic volumes through its design year. For example, projects that are designed to provide improvements for 10 years must be able to handle traffic forecasts for year 2010. Design years for this project are year 2010 for intermediate projects and 2025 for long-term projects. Traffic forecasts will be developed using the MAG EMME2 Regional Transportation Model.

D. Develop Projects that Accommodate the Many Functions of Grand Avenue

Grand Avenue serves several different functions at the same time:

- US 60 that serves statewide traffic;
- A major arterial street serving as a regional route for the Northwest Valley communities; and
- A street that provides local access to commercial and residential uses along the corridor

Each of these functions is described below. Based on comments from the public and community and agency representatives, it appears any improvement to Grand Avenue must maintain these various functions.

State Highway – Grand Avenue has served as a major statewide route for many decades. It has historically carried the route numbers of US 60, SR 93, SR 89 and others. Today, Grand Avenue is designated as US 60 and effectively serves as the extension of US 93, which begins in Wickenburg, continues northward across Hoover Dam to link with I-15 in Las Vegas. US 93 has been designated by Arizona as a CANAMEX Highway, and ADOT is spending over $250 million to upgrade US 93 to a four-lane divided highway through its entire length in Arizona. In addition, ADOT is evaluating a bypass around Wickenburg and ADOT has begun construction on the portion of Grand Avenue (US 60) from north of the Beardsley Canal to near the Wittman railroad overpass. This project will complete Grand Avenue as a four- or six-lane roadway from Phoenix to Wickenburg.

SR 303L is planned to be widened to a four-lane divided highway and extended to Lake Pleasant Road. Grand Avenue is a main link between SR 101L and SR 303L. East of SR 101L, ADOT has programmed to complete seven new grade separations along Grand to take one of the streets out of the six-legged intersections. These improvements will help eliminate notorious bottlenecks on Grand and can affect traffic on Grand through the study area west of SR 101L. All of these actions indicate that without a major diversion route, Grand Avenue in the study area will likely continue to serve as a through highway.

Regional Arterial Roadway – One of the issues in the study area is the absence of a continuous arterial network in this part of the metropolitan area. The railroad, the rivers and the large planned communities that have been developed have combined to create the least continuous street network found anywhere in the metropolitan area. Grand Avenue, as a result, carries an extra burden as a major arterial street serving the region.

Local Access – The majority of traffic on Grand Avenue is more locally generated. Grand Avenue provides access to the commercial and residential uses along the corridor in the City of Surprise, City of El Mirage, City of Peoria, Town of Youngtown and the unincorporated areas of Sun City and Sun City West. The rapid development that is occurring, particularly in the City of Surprise, will continue to accelerate the arterial use of the highway over the through-highway function.

E. Develop Projects that Can Be Constructed

Recommended improvements should be implementable. Projects should be practical and fit within available right-of-way and meet environmental regulations. Projects should meet ADOT Standards, Policies and Procedures. The preferred option will also need to be able to be conductive to staged construction (to meet available transportation funds) and be able to address the short-term needs as well as long-term needs of the corridor. Staged construction could also minimize disruptions and street closures to traffic.

F. Develop Projects that Are Fundable

Potential investment options need to have a realistic opportunity to be included in the MAG Long-Range Transportation Plan (LRTP). Federal regulations require that a financial plan with existing and proposed funding sources accompany the MAG LRTP. Total construction and operating costs for all projects within the MAG LRTP plan cannot exceed projected transportation funds. Thus, project costs for investment options will need to be reasonable and fit within the LRTP projected available transportation funds. Short-term smaller projects may be eligible for money dedicated to safety improvements.

5.3 MAJOR ISSUES

Upon reviewing the list of issues identified for the corridor, they all appear to have merit in this corridor study and none should be deleted. However, many of the issues are closely related and can be combined to narrow the list. Below is the combined list of 12 major issues that the URS Team believed should be addressed in the corridor study. The issues are not prioritized as the agency and community representatives felt all 12 issues were important and needed to be addressed in this study.

Barrier to Travel

Grand Avenue has a right-of-way of generally 150 feet through the study area. The BNSF has a parallel right-of-way also that is typically 100 to 150 feet wide. The result is a large swath that poses a major obstacle to pedestrians, bicyclists and golf cart drivers attempting to cross Grand Avenue. As discussed above, there are a limited number of streets that intersect Grand and very few of these cross Grand. The result is the Grand/BNSF corridor is a seam in the project area. Travel needs across the corridor are a major issue. Grade separations have been suggested as possible ways to improve crossing the railroad and Grand Avenue. El Mirage Road, Bell Road and Meeker Boulevard are intersections that have been identified as possible locations for grade separations.

Emergency Vehicle Access

Emergency vehicles can find their access to Boswell and Del E. Webb hospitals blocked by heavy train traffic on the BNSF rail line. This is a potential life-threatening problem that affects the Northwest Valley. The hospitals serve all the communities on both sides of Grand Avenue. Access to the hospitals from Grand is provided via 103rd Avenue, 107th Avenue, Meeker Boulevard and RH Johnson Boulevard. Grade separations were identified as possible solutions for improving access to the hospitals. Grand Avenue also serves as a route for the fire and police departments. Access to Grand Avenue (especially at 111th Avenue for the fire department) must be maintained for emergency vehicles. Congestion at intersections adds to the emergency vehicle response times. Pre-emption at signals would aid emergency vehicles.

Intersection Geometry

The need for intersection improvements along Grand Avenue was one of the issues raised the most. Almost every major intersection with Grand Avenue within the study area was identified as needing improvement to either increase safety or reduce congestion. As growth continues in the area, the intersections with Grand will become increasingly congested. The four intersections in Sun City and Youngtown are already very congested. Traffic in the Bell Road intersection is increasing rapidly and is compounded by the 45-degree skew of the intersection. Other intersections with Grand are becoming critical including RH Johnson/Sunrise, Greenway, Dysart and Thunderbird. The parallel railroad drainage channel and frontage roads complicate many of the intersection geometrics. The diagonal orientation of Grand creates challenges at every intersection.

As traffic volumes increase with development, the signalized intersections are the capacity limitation of the roadway. Suggestions for improvement include adding additional turn lanes and through lanes, signal improvements, and grade separations. East of SR 101L, grade separations were chosen as the solution for intersection improvements along Grand Avenue. Meeker Boulevard was identified as an intersection needing more turn lanes as turning traffic often queues into through travel lanes.

Travel Along Grand

Reducing traffic congestion along Grand Avenue was identified as a corridor need. The signalized intersections contribute to the travel delay along Grand. A synchronized traffic signal control system that responds to traffic demand is desired. The Grand Avenue corridor is included in the regional AZTech plans for intelligent transportation system (ITS) improvements that include loop detectors, closed-circuit television (CCTV) cameras and variable message signs (VMS). Potential applications for ITS along Grand Avenue should be explored.

Grand Avenue also has an inconsistent cross-section between SR 101L and SR 303L. For the majority of the corridor, Grand Avenue has a four-lane cross-section (two lanes in each direction). It widens out to a six-lane cross-section through parts of Sun City. There is some interest in developing Grand Avenue into an expressway.

Environmental Concerns

Environmental impacts should be minimized; particularly those associated with neighborhoods such as noise and visual impacts. Being a non-attainment area, air pollution is always a concern in the Phoenix metropolitan area. Enhanced noise abatement was requested for the corridor. The noise and air pollution contributed by truck traffic is also a concern. Restriction of traffic truck on Grand Avenue and SR 303L is desired. Historical or cultural resources should also not be impacted.

Aesthetics

The Grand Avenue corridor through the study area has more attractive land uses and more landscaping than most of Grand Avenue further to the southeast. Even so, there is community interest in further improvements and enhancements and in ensuring maintenance of the aesthetic features that exist. Grand Avenue serves as a gateway to the metropolitan area. The public views both the drainage channel and railroad paralleling Grand Avenue as eyesores. The drainage channel also tends to collect trash. There is interest in providing enhanced landscaping to help attract new development or redevelopment to the corridor. Aesthetic treatment of any new transportation facilities/features is also desired. Attractive designation signage for West Valley cities has been requested.

Regional Mobility/System Continuity

As discussed above, Grand Avenue is one of a few continuous routes through the study area. Other continuous routes include SR 101L, SR 303L, 99th Avenue, Olive Avenue and Bell Road. Grand Avenue provides a critical link in connecting SR 101L and SR 303L. Bell Road is severely congested and operates near capacity. Grand Avenue serves as a diversion route for traffic destined for Bell Road.

Two routes currently serve in a limited capacity as diversion routes for through traffic. SR 74 that traverses east-west just south of Lake Pleasant and connects to I-17 at Carefree Highway is increasingly being used as an alternative route for through traffic. SR 303L was built as a two-lane highway and is currently under the jurisdiction of MCDOT under an Intergovernmental Agreement with ADOT for that facility. MCDOT has begun construction of an SR 303L overpass of Grand Avenue and the railroad. The City of Surprise and the Sun City Grand development constructed structures for Clearview and Mountain View streets to go over SR 303L and to connect the two parts of the development. MCDOT will begin construction of SR 303L eastward to Lake Pleasant Road in 2002 and a new interim roadway between Indian School Road and McDowell Road. MAG completed a study and recommended SR 303L connect to I-17 at Lone Mountain section line. ADOT has begun a DCR/EA for that section of SR 303L.

There are requests to improve and extend El Mirage Road across Grand Avenue and down to Olive Avenue. Improvements along Olive Avenue have also been requested including widening it to four lanes and providing improved left-turn movements at Grand Avenue. Providing additional connections between Grand Avenue and Bell Road has also been suggested.

Safety

Several safety issues have been raised. These include signal timing at intersections is not long enough to allow pedestrians to cross the street; guardrail is not present along sections of the drainage channel paralleling Grand Avenue; and traffic signage does not meet the needs of the

elderly population. Suggested improvements for traffic signs include providing larger letters and clear and concise directions on signs. Improved street lighting was also suggested.

As stated previously, Grand Avenue has an inconsistent cross-section. A safety concern has been raised at locations where the six-lane section merges back to four-lane section as it causes driver confusion. Lack of turn lane designations and dotted lane striping through intersections also leads to driver confusion. The intersection of Dysart Road and Grand Avenue was maintained as an example.

Access Control

The railroad on the north side of Grand Avenue effectively provides a high degree of access control. Frontage roads exist along the southwest side of Grand Avenue through the City of El Mirage. The developments that have occurred in the past decade have generally limited access points to intersecting streets and a few driveways. However, new development along Grand Avenue in the City of Surprise will require additional access points and possible traffic signals along Grand Avenue. Access into new and existing shopping areas needs to be evaluated.

Controlling access along a roadway can increase capacity and improve safety; however, it can hinder economic and development opportunities along the roadway. A balance between the two is needed within the corridor. Extending frontage roads and limiting new development access to frontage roads are improvements that have been suggested. However, maintaining existing access to businesses is important. The Town of Youngtown has requested access to Grand Avenue be maintained at 111th Avenue, 111th Drive, and 113th Avenue. Controlling access along Bell Road has also been suggested.

Elderly Mobility

The elderly population in Maricopa County is expected to increase by 80% to approximately 20% of the total population by 2025. A large percentage of the population within the study area is retired or nears retirement age. A transportation system is needed within the corridor that maintains independence for the elderly and provides them safe travel options. This system must not ignore the fact that there still is a significant population in the workforce and in schools. The elderly population must be considered in the design elements for motorized and non-motorized travel and for automobile and transit travel.

Alternative Mode Travel

Grand Avenue is a multimodal corridor. Many of the citizens of the study area have a need for alternative modes of travel including transit, bicycles and walking. Existing transit service consists of one fixed bus route and paratransit service. Valley Metro Route 106 provides weekday service from Boswell Hospital in Sun City to Youngtown, Peoria, Glendale, Phoenix and Scottsdale. Paratransit (dial-a-ride) operations include the El Mirage Dial-a-Ride, Surprise

Dial-a-Ride, and Sun City Area Transit (SCAT), which serve Sun City, Sun City West and Youngtown. Transfers between dial-a-ride systems are available at several locations. All of the above services are available to the general public. In addition, Maricopa County Special Transportation Services provide limited service for seniors, those with disabilities and persons with low incomes. There is also an intercity bus stop in Youngtown, just south of Grand Avenue, serving Greyhound and K-T Lines.

A park-and-ride facility and better and more bus stops along Grand Avenue were identified as corridor needs. Some comments indicated that bicycle and pedestrian traffic should be accommodated within the corridor but should not be allowed on Grand Avenue. Better crossings of Grand Avenue and the railroad for pedestrians and bicycles were identified as a need. Deterring pedestrians from crossing Grand Avenue and the railroad at undesignated crossings is also desired. 107th Avenue was identified as a high pedestrian crossing area. Greenway Road was identified as a good location to cross Grand on a bicycle. Developing recreation corridors along dry riverbeds was also suggested. Golf cart usage along and across Grand Avenue is a concern that needs to be addressed. There is some interest in exploring light rail transit for the corridor.

Railroad

In addition to the "barrier" effect of the railroad right-of-way described above, there are other elements to consider. The railroad crosses nine streets at-grade. These crossings create delays to motorists and safety concerns as well as complicating the operation of traffic signals. There is a spur track that crosses Grand Avenue between El Mirage and Greenway roads. This active spur creates some delays to motorists and a safety issue. The major new-automobile off-loading facility near Thunderbird Road creates a lot of truck traffic. Much of this traffic is destined to all points of the state.

The current and future function of the railroad and its impact on traffic circulation needs to be evaluated. BNSF has indicated that train activity along the corridor is expected to increase as the metropolitan area grows. It was suggested that the need for grade separations with the railroad tracks and railroad operational improvements are two issues that should be evaluated. Lowering the railroad at cross streets to match the grade of Grand Avenue was also suggested. Exploring the options for passenger rail was also requested.

5.4 KEY CORRIDOR ISSUES

The main goal of the Grand Avenue Northwest Corridor Study was to develop a consensus on selecting a preferred infrastructure improvement option for the corridor so that the recommended option can be incorporated into the MAG Long Range Transportation Plan.

Key issues were identified in the corridor study by the URS Project Team. The key issues of the Grand Avenue Northwest Corridor Study are listed below, not in any particular order.

- Improve crossings of Grand Avenue and the railroad.
- Improve emergency vehicle access within the corridor.
- Improve traffic operations at intersections.
- Expedite travel along Grand Avenue.
- Minimize environmental impacts including noise, visual and air pollution.
- Improve aesthetics of the corridor.
- Identify opportunities to enhance street network continuity to improve regional mobility.
- Maintain and enhance system continuity on Grand.
- Improve safety within the corridor.
- Address access control policies for Grand Avenue.
- Enhance elderly mobility.
- Enhance alternative mode travel within the corridor.
- Develop strategies that seek to improve both rail and vehicular traffic within the corridor.

6.0 LONG-RANGE ROADWAY NEEDS

This chapter provides an assessment of the long-term roadway needs for the Grand Avenue Northwest Corridor. Long-term roadway needs were identified based on traffic forecasts for the corridor and input from the public and local agencies.

6.1 FUTURE TRAFFIC VOLUMES

6.1.1 Traffic Forecasts

Traffic forecasts for the study area were prepared by MAG utilizing the EMME/2 regional transportation model. The model was run in January and February 2001 to forecast 2010 and 2025 traffic volumes along Grand Avenue. A 2000 model run was also produced to compare model output to existing traffic counts. This comparison of model-predicted weekday daily volumes to actual counts provides a basis for refinement (if necessary) of future traffic forecasts made by the model. The 2000 and 2010 model run utilized the Department of Economic Security (DES) Socioeconomic Projections that have been adopted by MAG. The 2010 street network was checked to reflect projects currently programmed in the MAG 2001-2005 Transportation Improvement Program.

A series of 2025 model forecasts were run to create 2025 design volumes for the corridor. Seven 2025 runs were made in all. All of the runs included a street network consistent with the MAG Long Range Transportation Plan (LRTP) and thus had SR 303L coded as a four-lane expressway from I-10 to I-17, and coded in the network as a highway with access only at signalized intersections spaced approximately one mile apart. Differences between the model runs include the socioeconomic projections used and the coding of Grand Avenue both north and south of SR 101L.

South of SR 101L, Grand Avenue was coded for some of the model runs with the eight grade separation defined in the Grand Avenue Major Investment Study that are currently under design. In other runs, Grand Avenue was coded as an expressway as defined in the MAG Long Range Transportation Plan. North of SR 101L, Grand Avenue was coded with no improvements (No-Build) in one run, a full freeway in one run, a six-lane arterial street with some grade separations in one run, and a six-lane arterial street in the remaining runs.

As discussed in Chapter 2 – Current and Projected Socioeconomic Conditions, an alternative higher growth scenario for year 2025 was developed for the influence area to be used in a sensitivity analysis. The purpose of the sensitivity analysis is to provide a means of determining the impact to future Grand Avenue traffic volumes if population and employment growth in the influence area are higher than the DES projections. Some of the model runs were made with 2025 MAG Design Projections and other runs were made with 2025 Alternative Higher Growth Projections. Refer to Chapter 2 for more detail on the socioeconomic projections.

In summary, the following model runs listed in Exhibit 6.1 were used to forecast traffic volumes and develop design volumes. Exhibit 6.2 lists the traffic forecasts generated for each model run. The forecast volumes for each run were adjusted based on the comparison of 2000 model run volumes to actual 2000 counts. Model forecasts on certain segments were adjusted based on a comparison of counts to the 2000 model simulation. Overall, the model appears to overestimate traffic on this section of Grand Avenue.

Exhibit 6.1
List of Traffic Forecast Model Runs

1) 2000 MAG Adopted Projections with existing street network
2) 2010 MAG Adopted Projections with street network to include:
   1. 2001-2005 Transportation Improvement Program Projects
   2. Grand Avenue south of SR 101L – MIS grade separations
   3. Grand Avenue north of SR 101L – no build
   4. SR 303L as a four lane expressway I-10 to Lake Pleasant Road
3) 2025 MAG Design Projections with street network to include:
   5. MAG Long Range Plan
   6. Grand Avenue south of SR 101L – MIS grade separations
   7. Grand Avenue north of SR 101L – no build
   8. SR 303L as a four lane expressway I-10 to I-17
4) 2025 MAG Design Projections with street network to include:
   9. MAG Long Range Plan
   10. Grand Avenue south of SR 101L – Expressway (as defined in MAG LRTP)
   11. Grand Avenue north of SR 101L – six lane arterial street
   12. SR 303L as a four lane expressway I-10 to I-17
5) 2025 MAG Design Projections with street network to include:
   13. MAG Long Range Plan
   14. Grand Avenue south of SR 101L – MIS grade separations
   15. Grand Avenue north of SR 101L – six lane arterial street
   16. SR 303L as a four lane expressway I-10 to I-17
6) 2025 Alternative Higher Growth Projections with street network to include:
   17. MAG Long Range Plan
   18. Grand Avenue south of SR 101L – Expressway (as defined in MAG LRTP)
   19. Grand Avenue north of SR 101L – six lane arterial street
   20. SR 303L as a four lane expressway I-10 to I-17
7) 2025 Alternative Higher Growth Projections with street network to include:
   21. MAG Long Range Plan
   22. Grand Avenue south of SR 101L – MIS grade separations
   23. Grand Avenue north of SR 101L – six lane arterial street
   24. SR 303L as a four lane expressway I-10 to I-17
8) 2025 Alternative Higher Growth Projections with street network to include:
   25. MAG Long Range Plan
   26. Grand Avenue south of SR 101L – MIS grade separations
   27. Grand Avenue north of SR 101L – six lane arterial street some grade separations
   28. SR 303L as a four lane expressway I-10 to I-17
9) 2025 Alternative Higher Growth Projections with street network to include:
   29. MAG Long Range Plan
   30. Grand Avenue south of SR 101L – Expressway (as defined in MAG LRTP)
   31. Grand Avenue north of SR 101L – six lane freeway
   32. SR 303L as a four lane expressway I-10 to I-17

Exhibit 6.2
Forecast Traffic Volumes

			2025 Forecasts by Model Run (see Exhibit 6.1)						
Grand Avenue Segment	**2000**	**2010**	**# 3**	**# 4**	**# 5**	**# 6**	**# 7**	**# 8**	**# 9**
West of SR 303L	9,400	25,900	35,600	42,800	42,900	53,600	53,700	54,900	56,600
SR 303L to RH Johnson/Sunshine	13,500	31,100	34,200	45,900	46,000	50,000	50,200	45,700	48,100
RH Johnson to Meeker/Reems	17,600	30,000	34,900	49,000	49,000	53,000	53,000	45,700	48,100
Meeker to Litchfield	22,100	34,400	37,800	49,000	49,000	49,000	49,100	49,500	73,400
Litchfield to Bell	20,200	32,600	35,900	51,700	52,700	50,800	51,700	45,600	73,400
Bell to Dysart	23,300	27,600	32,900	49,500	49,200	49,400	48,800	48,900	98,000
Dysart to Greenway	27,100	29,600	32,600	42,800	42,700	43,300	42,700	40,900	98,000
Greenway to El Mirage Rd	36,100	39,700	43,700	49,500	49,600	51,500	51,100	47,800	98,000
El Mirage to Thompson Ranch/Thunderbird	25,400	31,700	34,900	40,700	40,800	42,700	42,300	47,800	122,400
Thunderbird to 111th Ave	29,700	36,600	40,300	44,050	43,700	45,050	43,900	49,100	122,400
111th Ave to 107th Ave	33,900	41,500	45,700	47,400	46,600	47,400	45,400	50,300	122,400
107th Ave to 103rd Ave	33,900	42,700	47,000	49,900	48,800	49,700	47,800	49,700	136,100
103rd Ave to 99th Ave	37,400	44,900	49,400	52,300	51,000	52,000	50,100	49,000	136,100
99th Ave to SR 101L	35,000	42,000	46,200	62,500	57,100	61,700	55,600	60,800	152,500
East of SR 101L	24,500	29,800	38,600	63,400	42,600	61,000	40,900	53,400	138,300

			2025 Forecasts by Model Run (see Exhibit 6.1)						
Cross Street	**2000**	**2010**	**# 3**	**# 4**	**# 5**	**# 6**	**# 7**	**# 8**	**# 9**
SR 303L	4,500	11,900	44,800	44,800	44,700	51,000	50,800	53,500	52,400
RH Johnson/Sunrise	10,400	14,600	21,000	20,700	20,600	26,100	26,200	19,000	23,200
Meeker/Reems	15,900	21,100	25,600	26,000	26,100	36,600	31,500	37,300	36,300
Litchfield	4,400	13,600	20,700	18,500	17,200	15,700	15,100	9,600	14,400
Bell	32,800	40,400	56,400	56,900	57,300	56,400	56,100	61,000	54,900
Dysart	13,700	14,900	29,000	28,700	28,200	24,500	24,600	24,400	30,000
Greenway	11,600	14,100	20,000	19,700	19,300	16,700	15,900	36,900	16,100
Thunderbird/ Thompson Ranch	8,900	12,500	21,400	24,300	25,200	20,400	20,200	13,800	10,700
111th Ave	8,500	12,300	16,200	16,300	16,200	16,200	16,300	16,500	15,400
107th Ave	15,300	23,000	29,500	29,600	29,400	29,500	29,700	29,900	27,900
103rd Ave	12,700	14,000	15,900	16,300	16,100	16,500	16,300	13,200	13,800
99th Ave	17,800	27,400	35,100	37,900	36,600	37,200	35,500	36,800	39,800

Counts made in December 2001 by MCDOT are 14,200 vpd. Count east of SR 303L was 13,500, same as in 2000.

6.1.2 Design Volumes

The 2010 traffic design volumes for the Grand Avenue Northwest Corridor are shown in Exhibits 6.3 and 6.4. These volumes are the same as the adjusted 2010 forecast volumes from MAG shown in Exhibit 6.2. The 2010 design volumes on Grand Avenue range from 25,900 to 44,900 vehicles per day.

The 2025 traffic design volumes are also shown in Exhibits 6.3 and 6.4. These volumes were chosen as the likely traffic volumes that will occur along the corridor for 2025. These design volumes were chosen based on analyzing the seven forecasts made for 2025. Model run #3 represents a no-build alternative for the corridor. By comparing model runs #3 and #5, it is apparent that with additional capacity on Grand Avenue, traffic volumes will increase significantly (+10,000 vehicles on some sections). Therefore, forecasts from alternative #3 were not used for design volumes.

Model runs #4 and #5 were compared to determine the difference in traffic forecasts based on whether Grand Avenue is an expressway south of SR 101L or if it is an arterial with the MIS grade separations. The difference in forecasts between the two runs is insignificant for all segments of Grand Avenue except for between SR 101L and 99th Avenue which shows an increase of 5,000 vehicles per day if an expressway is constructed south of SR 101L. A comparison of model runs #6 and #7 show similar results. Therefore, the model runs showing Grand Avenue as an expressway were not used as design volumes because of the minimal difference in volumes and the preference expressed by local agencies that wish to maintain access including signalized intersections that would be incompatible with the expressway concept.

Model runs #5 and #7 were then compared to determine the impact to future Grand Avenue traffic volumes if population and employment growth in the influence area are higher than the DES projections. The alternative higher growth projections resulted in significantly higher traffic forecast (+4,000 vehicles) for only segments northwest of the Meeker Boulevard/Grand Avenue intersection. Therefore, model run #5 was chosen as design volumes except for those segments northwest of the Meeker Boulevard/Grand Avenue intersection for which the volumes used came from model run #7. As a result, forecast traffic volumes remain fairly consistent the full length of Grand Avenue between SR 101L and SR 303L. The 2025 design volumes on Grand Avenue range from 40,800 to 57,100 vehicles per day.

Exhibit 6.3
2010 and 2025 Design Volumes Along Grand Avenue

Grand Avenue Segments	Design Volumes (Average Daily Traffic)	
	2010	2025
West of SR 303L	25,900	53,700
SR 303L to RH Johnson/Sunshine	31,100	50,200
RH Johnson to Meeker/Reems	30,000	53,000
Meeker to Litchfield	34,400	49,000
Litchfield to Bell	32,600	50,000
Bell to Dysart	27,600	49,200
Dysart to Greenway	29,600	42,700
Greenway to El Mirage Road	39,700	49,600
El Mirage to Thompson Ranch/Thunderbird	31,700	40,800
Thunderbird to 111th Avenue	36,600	43,700
111th Avenue to 107th Avenue	41,500	46,600
107th Avenue to 103rd Avenue	42,700	48,800
103rd Avenue to 99th Avenue	44,900	51,000
99th Avenue to SR 101L	42,000	57,100
East of SR 101L	29,800	42,600

Source: URS based on MAG forecasts

Exhibit 6.4
2010 and 2025 Design Volumes at Grand Avenue

Cross Street	Design Volumes (Average Daily Traffic)	
	2010	2025
SR 303L	11,900	50,800
RH Johnson/Sunshine	14,600	20,600
Meeker/Reems	21,100	26,100
Litchfield Road	13,600	24,800
Bell Road	40,400	57,300
Dysart Road	14,900	28,200
Greenway Road	14,100	19,300
Thompson Ranch/Thunderbird	12,500	25,200
111th Avenue	12,300	16,200
107th Avenue	23,000	29,400
103rd Avenue	14,000	16,100
99th Avenue	27,400	36,600

Source: URS based on MAG forecasts

Model run #8 represents a scenario where grade separations were added to Grand Avenue between SR 101L and SR 303L. The model run shows that with the grade separations the traffic forecasts for the corridor would not increase over the design volumes. The volumes on Grand would not increase because the capacity of Grand Avenue is restricted by the large number of remaining signalized intersections. It is expected that some traffic volumes on the cross streets without the grade separations would divert to cross streets that have the grade separations.

Model run #9 represents a scenario with Grand Avenue as a six-lane freeway between SR 101L and I-17. This model run represents the maximum capacity benefit associated with removing traffic signals along Grand Avenue. Traffic volumes under this scenario are expected to increase significantly within the study corridor. Volumes are expected to range between 48,000 and 152,000 vehicles per day.

6.1.3 Future Level of Service – No-Build Alternative

As defined in the 2000 *Highway Capacity Manual*, level of service is a quality measure describing operational conditions within a traffic stream. Six levels of services (LOS) are defined using letters for each type of roadway facilities. LOS A represents the best operating condition; LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. In urban areas, LOS D is usually acceptable to the public. However during peak periods, LOS D is often unattainable and LOS E is acceptable to local jurisdictions.

The level of service of an arterial street is controlled by the how well vehicles can pass through the signalized intersection along the arterial. The level of service was calculated at the intersections along Grand Avenue using procedures from the 2000 Highway Capacity Manual. Year 2010 and 2025 level of service was estimated using the 2010 and 2025 design volumes developed above and existing intersection geometrics. Exhibit 6.5 summarizes the estimated level of service at the major intersections along Grand Avenue for the A.M. and P.M. peak hours in Year 2010 and 2025.

Three Grand Avenue intersections are expected to operate at LOS E or worse in 2010: Bell Road, Thunderbird Road, and 107th Avenue. In 2025, all the intersections except 103rd Avenue are expected to operate at LOS E or worse. The geometric improvements needed at each intersection so that the intersection will operate at LOS D or better are presented in Section 6.2.2.

Exhibit 6.5
2010 and 2025 Intersection Level of Service (No-Build Alternative)

Intersection	Level of Service			
	2010		2025	
	AM	PM	AM	PM
RH Johnson/Sunshine	C*	C	F*	F
Meeker/Reems	D	D	F	F
Litchfield Road	B	C	D	F
Bell Road	F	F	F	F
Dysart Road	C	C	F	F
Greenway Road	D	D	F	F
Thompson Ranch/Thunderbird	F*	F	F*	F
113th Avenue	B	B	C	E
111th Avenue	D	D	E	F
107th Avenue	E	F	F	F
103rd Avenue	D	D	D	D
99th Avenue	D	D	F	F

*Level of Service is estimated because turn movements were not available to calculate LOS.

6.2 ROADWAY NEEDS

6.2.1 Capacity Improvement Needs for Grand Avenue

Grand Avenue has an inconsistent cross-section; typically four lanes are provided except between 99th Avenue and 103rd Avenue where there are six lanes. A safety concern has been raised by the public at locations where the six-lane section merges back to a four-lane section as it causes driver confusion.

Based on the capacity analysis of the intersections along Grand Avenue, three lanes in each direction on Grand Avenue are needed today through the 107th/Grand and Bell/Grand intersections to achieve LOS D. The analysis indicates that the daily capacity of the four-lane sections of Grand Avenue is approximately 35,000 vehicles. The existing daily traffic volumes for the sections of Grand Avenue between SR 101L and the Thunderbird/Grand intersection approach 35,000 vehicles. Therefore, Grand Avenue will need to be widened to six lanes between SR 101L and the Thunderbird/Grand intersection by 2010.

Between the Thunderbird/Grand intersection and SR 303L, Grand Avenue needs to be widened to six lanes by 2025. A six-lane section of Grand Avenue should provide a capacity approaching 55,000 vehicles. This capacity should accommodate forecast volumes on Grand through 2025.

6.2.2 Intersection Improvements Needs

A concern of local jurisdictions, community representatives and the public including the elderly is the potential that emergency vehicles may have their access to Boswell and Del E. Webb hospitals blocked by train traffic on the Burlington Northern Santa Fe Railroad (BNSF) rail line. This is a potential life-threatening issue that affects the Northwest Valley because the hospitals serve all the communities on both sides of Grand Avenue. Access to the hospitals from Grand is provided via 103rd Avenue, 107th Avenue, Meeker Boulevard and RH Johnson Boulevard. A grade separation of the railroad and a connection from Grand to each hospital has been identified as a corridor need and as a solution for eliminating the possibility of access to the hospitals being blocked by trains.

Based on the capacity analysis of each intersection, the following improvements are needed for the intersections to operate at LOS D or better.

99th Avenue

2010

- Adjust signal timing

2025

- Add exclusive northwest bound (NWB) and southeast bound (SEB) right turn lanes to Grand Avenue
- Add southbound (SB) left turn lane on 99th Avenue to create dual left turn lanes

107th Avenue

2010

- Widen Grand Avenue to three through lanes in each direction (project is needed now)

2025

- Add SB and northbound (NB) left turn lanes on 107th Avenue to create dual left turn lanes

111th Avenue

2010

- Adjust signal timing

2025

- Widen Grand Avenue to three through lanes in each direction

113th Avenue

2010

- None

2025

- None

Thunderbird Road/Thompson Ranch Road

2010

- Widen Grand Avenue to three through lanes in each direction

2025

- Add SB left turn on Thompson Ranch Road to create dual left turn lanes
- Include a signal overlap phase for NB right turn lane on Thunderbird Road
- Add NWB left turn on Grand Avenue to create dual left turn lanes

Greenway Road

2010

- None

2025

- Widen Grand Avenue to three through lanes each direction

Dysart Road

2010

- None

2025

- Widen Grand Avenue to three through lanes each direction
- Widen Dysart Road to two through lanes each direction
- Add a SB left turn on Dysart Road to create dual left turn lanes

Bell Road

2010

- Widen Grand Avenue to three through lanes in each direction (project is needed now)
- Add NWB and SEB left turn lanes on Grand Avenue to create dual left turn lanes
- Include a signal overlap phase for EB right turn lane on Bell Road

2025

- Widen WB Bell Road to three lanes
- Construct a grade separation

Litchfield Road

2010

- None

2025

- Widen Grand Avenue to three through lanes in each direction

Meeker Boulevard/Reems Road

2010

- Include NB protected left turn phase on Reems Road and SB protected left turn phase on Meeker Boulevard (implementation is currently under evaluation by ADOT)
- Add a SB left turn on Reems Road to create dual left turn lanes

2025

- Widen Grand Avenue to three through lanes in each direction
- Add NWB left turn on Grand Avenue to create dual left turn lanes

RH Johnson Boulevard

2010

- None

2025

- Widen Grand Avenue to three through lanes in each direction
- Include NB and SB protected left turn phase on RH Johnson Boulevard

A need identified by the public at all of the intersections is to lower the railroad at cross streets to match the grade of Grand Avenue. Lowering the railroad could improve sight distance and increase drivers' comfort. Evaluation of safety devices such as gates at the railroad crossings has been identified as another need. Other general intersection needs identified include extension of exclusive turn lanes to provide for more storage, better turn lane designations and more pavement marking extensions through intersections. The intersection of Dysart Road and Grand Avenue was stated as a location needing these improvements. Inadequate signal timing for pedestrians to cross intersections was identified as a concern.

6.2.3 Roadside Development Needs

This section presents needs that have been identified during the study that relate to the side of the road and median areas. The lack of guardrail along sections of the drainage channel paralleling Grand Avenue has been raised as a major safety concern.

Traffic signage has been identified as inadequate in meeting the needs of the elderly population. Suggested improvements for traffic signs include providing larger letters and clear and concise directions on signs. Improved street lighting has also been suggested.

There is community interest in further improvements and enhancements to the existing landscaping and ensuring maintenance of the aesthetic features that exist. The public views both the drainage channel and railroad paralleling Grand Avenue as eyesores. The drainage channel also tends to collect trash. There is interest in providing enhanced landscaping to help attract new development or redevelopment to the corridor. Aesthetic treatment of any new transportation infrastructure is also desired. Attractive designation signage for West Valley Cities has also been requested by the local jurisdictions.

Bicycle and pedestrian needs along Grand Avenue are identified in Chapter 7, Alternative Mode Needs.

6.2.4 Intelligent Transportation System Needs

Traffic signals along Grand Avenue are not presently coordinated. There is strong agreement from the public and local agencies that the signals need to be coordinated. ADOT has indicated that the signals need communication links before they can be coordinated. Therefore, a need for the corridor is to provide a conduit along Grand Avenue for fiber-optic communications to support Smart Corridor traffic management functions such as traffic detection, closed circuit television cameras and variable message signs. In addition, the Phase 1 Smart Corridor along Grand Avenue should be extend from Bell Road to SR 303L (currently it is designated from Van Buren Street to Bell Road). ITS applications consistent with the MAG ITS Strategic Plan should be implement the whole length of the Grand Avenue corridor. Preemption of traffic signals for emergency vehicles is also needed along the corridor.

Traffic signal coordination and other traffic operations improvements along Bell Road from Grand Avenue to SR 101L are being studied by MCDOT.

6.2.5 Other Needs

There are few continuous routes through the Northwest Valley area. In addition to Grand Avenue, continuous routes include SR 101L, SR 303L (planned or under construction), 99th Avenue, Olive Avenue and Bell Road. There is a potential opportunity to extend El Mirage Road

across Grand Avenue as a new north-south route within the corridor area. The benefits of and complications associated with this idea will be further explored.

Enhancement of east-west streets such as Olive and Northern Avenues may also help accommodate future traffic growth in the corridor area. MAG and participating agencies are undertaking additional studies of this potential through the East-West Mobility Study. The City of Glendale began development of a DCR for a "superstreet" on Northern Avenue in 2002.

Controlling access along a roadway can increase capacity and improve safety; however, it can hinder economic and development opportunities along the roadway. A balance between the two is needed within the corridor. Extending frontage roads and limiting new development access to frontage roads are improvements that have been suggested. However, maintaining existing access to businesses is important. The Town of Youngtown has requested access to Grand Avenue be maintained at 111th Avenue, 111th Drive, and 113th Avenue. Controlling access along Bell Road has also been suggested.

7.0 ALTERNATIVE MODE NEEDS

This chapter presents the alternative mode needs identified in the Grand Avenue Northwest Corridor Area. Alternative mode needs were identified based on input from the public and local agencies, review of previous studies and community plans, and field review of existing conditions. Although a need may be identified, the solution to that need may or may not be incorporated into the final recommendations for Grand Avenue.

7.1 TRANSIT

While public transit currently plays a minor role in the Grand Avenue Northwest Corridor (see Chapter 3), its importance is expected to rise in the future. Growth in demand for transit services is fueled by changing demographics (e.g., the aging of the population, but also an influx of families into Surprise as that city continues to develop), concerns about traffic congestion and air quality, and increasing recognition that transportation alternatives are necessary to meet the mobility needs of residents of the MAG region.

Transit needs in the Grand Avenue Northwest Corridor can be divided into four categories: fixed route local bus service, neighborhood circulator service, demand responsive (dial-a-ride) service, and express or high-capacity transit service (e.g., bus rapid transit, rail rapid transit, commuter rail). A fifth possible category of service is known as "flex route" or route deviation. This concept involves buses generally operating on a fixed route, but deviating up to 3/4 mile from the regular route to pick up and drop off eligible passengers. It has the advantage of meeting the requirements of the federal Americans with Disabilities Act (ADA) without a separate demand responsive service for those unable to access the bus system.

7.1.1 Fixed Route Local Bus Service

This type of service consists of conventional transit buses operating at regular intervals throughout the day on major streets, making frequent stops to receive and discharge passengers. It constitutes the backbone of the regional transit system. With the exception of Route 106 connecting Peoria with Boswell Memorial Hospital, the study corridor lacks this type of service. On Grand Avenue, existing service (the Yellow Line) terminates in downtown Peoria, nearly 2 miles short of SR 101L at the southern limit of the study area.

The current absence of service is reflected in the following needs expressed by agency staff and citizens at a series of agency/community forums and at a public open house on September 27, 2000:

- Extend regional bus service into the study area as demand warrants.
- Enhance transit opportunities (general comment).

- Provide transit service and bus stops along Grand Avenue.
- Provide more choices of modes. Many residents of the study area need alternative modes.

In addition, a series of MAG public forums on senior mobility issues in the spring of 2001 elicited the following ideas from attendees: more bus stops, mid-bus stop drop-offs, more routes and more frequent service on existing routes, sheltered stops with benches and misters, and neighborhood terminals.

In light of this input, there appears to be some demand for local bus service on Grand Avenue from Peoria to Surprise and Sun City West. According to service standards in the Valley Metro Short Range Transit Report and Long Range Transit Plan, such service should ultimately operate seven days a week, including evenings, with headways of no more than 15 minutes during peak periods and 30 minutes at most other times. A bus route on Grand Avenue could interchange with routes proposed for Bell Road, Dysart Road and other intersecting streets.

Given the large elderly population of the study area, bus stops should be frequently spaced (approximately every quarter-mile, as specified in the Valley Metro Bus Stop Handbook) with convenient pedestrian access and sheltered benches. Maximum physical separation from traffic lanes enhances both actual and perceived safety for transit riders. Bus service implementation should be closely coordinated with related pedestrian improvements such as curbs and sidewalks along Grand, and with land use policies to encourage linkages to transit stops. All new bus stops should be ADA-compliant.

The limited Grand Avenue right-of-way adjacent to BNSF right-of-way severely limits bus stops and pull-outs in many locations. Similar conflicts exist further southeast along Grand, and no good solution have been found. As a result, local bus service along Grand Avenue may have to be limited in favor of routes on other arterials.

7.1.2 Neighborhood Circulator Service

This type of service typically uses small or medium buses on relatively short routes in areas that are not cost-effective to serve with conventional line-haul service. It is especially appropriate for communities such as Sun City and Sun City West with curvilinear street networks and limited connectivity to the regional roadway system. Circulator routes connect neighborhoods with local activity centers and with regional bus routes at designated transfer points. The unobtrusiveness of the smaller buses makes it easy for them to pull into the parking lots of neighborhood shopping centers and other popular destinations of retirees. Representatives of MAG member jurisdictions are studying the use of circulators in the transit element of the MAG Northwest Area Transportation Study to be completed later in 2002.

A circulator route known as Route NWV (Northwest Valley) operated for several years, connecting Sun City, El Mirage, Surprise and Sun City West. It was discontinued because of the

loss of revenue sources. However, this route suffered from infrequent service, minimal marketing, long travel times (due to the need for multiple crossings of Grand Avenue), and the absence of connections with regional transit except at Boswell Hospital, the east end of the route.

Once regional routes have been extended within and across the study corridor, neighborhood circulators offering more frequent and convenient service should be considered for Sun City, Sun City West, Youngtown and Surprise. Several such routes have recently been initiated in Tempe, and Phoenix will soon implement two routes in the Ahwatukee area. Neighborhood circulators have the potential to reduce the demand for dial-a-ride service, which is more expensive to provide. One of the draft recommendations of the MAG Regional Action Plan on Aging & Mobility calls for neighborhood circulators and community buses. In a recent MAG survey of senior citizens, the majority of respondents rated "neighborhood shuttle buses" as one of the two alternatives that would be most beneficial to seniors.

7.1.3 Dial-a-Ride Service

Dial-a-ride is a form of demand responsive service provided by the City of El Mirage, the City of Surprise and Sun Cities Area Transit that currently covers most of the Grand Avenue Northwest Corridor. Coordination between the three operations is limited, however, and vehicles generally do not cross jurisdictional boundaries. Service is much less extensive in El Mirage and Surprise than in Sun City and Sun City West. There is a clear need for greater coordination and possibly consolidation of dial-a-ride service throughout the Northwest Valley (including Peoria and Glendale). Longer hours of operation and improved response times are also desired. The East Valley Dial-a-Ride, which combined formerly separate programs in five East Valley cities, is a good example of multi-jurisdictional coordination.

Specific needs expressed during the agency and public involvement process include:

- Improve local dial-a-ride service across jurisdictional boundaries.
- Enhance elderly mobility. (Seniors and persons with disabilities often have difficulty using the fixed route bus system, do not know how to use it or are afraid to ride it.)

The City of Surprise identified dial-a-ride as a major transit issue during development of the scope of work for the upcoming MAG Northwest Area Transportation Study, which will address multimodal transportation needs throughout the Northwest Valley. The recent MAG public forums on senior mobility issues identified several specific needs, including: coordinate a regional demand responsive transit system with central dispatching, allow dial-a-ride to cross boundaries (or make it easier to transfer between systems), allow seniors to call ahead a day or two to schedule pick-ups, and coordinate dial-a-ride with the bus system. Surprise is preparing a transit operations plan with the help of an outside consultant.

Dial-a-ride service is currently open to the general public in Glendale, Peoria, Surprise, El Mirage and the Sun Cities. In areas of the Valley with more extensive bus service, eligibility is generally limited to seniors and persons with disabilities. Once bus service in the Northwest Valley improves to the levels prevailing elsewhere in the region, dial-a-ride eligibility may be similarly restricted, especially with the growth of the elderly population requiring transportation services.

The voters in the City of Glendale approved a transportation funding election in November 2001. Voter approval of the sales tax will lead to improvement of Glendale's dial-a-ride services.

7.1.4 Express/High-Capacity Transit Service

Express and high-capacity transit services are designed to draw riders away from their automobiles, especially during peak travel periods, by offering greater speed and comfort than local bus service. The Phoenix metro area currently has a network of express bus routes offering limited service during peak hours, 6:00 to 9:00 AM and 3:00 to 6:00 PM weekdays. None of this service extends to the Grand Avenue Northwest Corridor or anywhere in Peoria, El Mirage, Surprise or the Sun Cities.

Three types of express or high-capacity transit options have been identified for the Grand Avenue Northwest Corridor. The feasibility of each mode will be considered in Chapter 8.

Bus Rapid Transit (BRT) uses conventional or specially designed buses to provide rapid service between suburban park-and-ride facilities and the central business district. Phoenix will implement this type of service in 2003, primarily using high-occupancy vehicle (HOV) lanes on freeways. Buses will run approximately every 15 minutes in each corridor from 5:00 to 9:00 AM and 3:00 to 7:00 PM on weekdays. In addition, several "reverse commute" trips will be offered. In some regions, express bus or BRT operates as an all-day service.

Under the recommended roadway alternative, Grand Avenue would remain an arterial with many traffic signals. To maintain high travel speeds in this environment, BRT could possibly require exclusive bus lanes or HOV lanes, and priority treatment at signalized intersections.

Light Rail Transit (LRT) is currently under design for a 2006 opening date in a 20-mile corridor extending from Spectrum (Chris-Town) Mall in Phoenix to the East Valley Institute of Technology in Mesa. This Central Phoenix/East Valley line will run predominantly in reserved lanes on-street, although LRT can also operate in separate rights-of-way. Subsequent extensions will bring the line east to downtown Mesa and north to Metrocenter, and an additional extension to downtown Glendale may be added.

MAG has identified a number of additional corridors, including Grand Avenue, for long-term consideration of light rail or other high-capacity transit. LRT on arterial streets requires exclusive track lanes, and benefits greatly from signal priority treatments. Stations are typically located

approximately one mile apart, with parking available at some locations. Because of the distance from the regional core and the lead time required to design, finance and build LRT, this mode would probably not reach the Grand Avenue Northwest Corridor until 2020 or later.

Commuter Rail involves the operation of passenger trains, primarily during peak hours, on existing railroad lines. Usually these lines are shared with freight trains, as they would be in the Grand Avenue Northwest Corridor. Parking is almost always provided at suburban commuter rail stations. Unlike BRT and LRT, commuter rail service is not currently planned for the MAG region. Several communities have, however, expressed an interest in further study of commuter rail. MAG has initiated a study of high-capacity transit needs in the region, with a focus on existing rail corridors, including the BNSF along Grand Avenue. The RPTA is also conducting a Regional Transit Study. Recommendations from these studies will be incorporated into the new MAG Regional Transportation Plan. While commuter rail will be a focus of the MAG High Capacity Transit Plan, other rail and high capacity modes will also be considered for these corridors.

Citizens and agency staff expressed the following needs at the agency/community forums and public open house:

- Study high capacity transit alternatives to link the study area with other communities in metropolitan Phoenix.
- Consider passenger light rail service in the corridor.
- Consider commuter rail service in the BNSF right-of-way.
- Provide park-and-ride lots. (Grand Avenue/SR 101L was suggested as a location.)

Park-and-ride lots are an important element of any express or high-capacity transit system. The recently completed MAG Park-and-Ride Site Selection Study has identified the Glendale Avenue/SR 101L interchange, near the planned Phoenix Coyotes hockey arena, as a near-term "target area" for such a facility. Grand Avenue/Litchfield Road is a long-term target area for a park-and-ride lot.

7.1.5 Summary of Transit Needs

Exhibit 7.1 summarizes transit needs in the Grand Avenue Northwest Corridor for three timeframes: short-term (zero to five years), mid-term (five to 10 years) and long-term (10 to 20 years). Short-term items are the most pressing needs that should be addressed immediately if funding were available. Mid-term needs are less pressing and depend on demand that may not yet exist in the relatively low-density areas that much of the corridor traverses. Long-term needs would be addressed 10 or more years in the future, for reasons of either feasibility or demand.

Exhibit 7.1
Summary of Transit Needs

Need	Timeframe
The regional bus system needs to be extended through the study corridor into Surprise, El Mirage, Youngtown, Sun City and Sun City West.	Short-Term
Bus stops in the study corridor need to be designed to maximize passenger safety and comfort.	Short-Term
Demand responsive (dial-a-ride) services throughout Northwest Corridor communities require restructuring to better meet travel needs, especially those of older residents.	Short-Term
Park-and-ride capacity is needed near the east end of the corridor.	Short- to Mid-Term
Bus routes and dial-a-ride services will need to meet regional service standards.	Mid-Term
Surprise, Youngtown, Sun City and Sun City West will require improved alternatives for local circulation.	Mid- to Long-Term (depending on demand)
Park-and-ride capacity will be needed in the western portion of the corridor.	Mid-Term
Express and/or high-capacity transit, as an integral part of the regional system, may be needed in the future. (Needs will be identified in upcoming MAG High Capacity Transit Plan.)	Short- to Mid-Term (studies); Mid- to Long-Term (implementation)

It should be emphasized that no funding currently exists to meet even the short-term transit needs. Chapter 8 identifies cost and implementation issues.

7.2 PEDESTRIANS

Many issues were raised at the agency/community forums and the public meeting. From these meetings, 13 issues for the corridor study were developed and are presented in Chapter 5.

Needs in the corridor that pertain to pedestrian travel include:

- Improve aesthetics of the corridor to increase pedestrian comfort.
- Improve crossings of Grand Avenue and the railroad.
- Improve traffic operations at intersections.
- Improve safety within the corridor.
- Enhance elderly mobility.
- Enhance alternative mode travel within the corridor.

7.2.1 Impediments to Walking

There are many impediments to pedestrian travel within the Grand Avenue Northwest Corridor. Below is a summary of infrastructure impediments to walking:

1. No curbs or sidewalks. In the corridor, most intersecting streets have attached walkways ranging from 5 to 5.5 feet wide. Most are also edged with curb and gutter. Grand Avenue does not have curbs or walkways for much of its length. The exception is short stretches of sidewalk serving recently developed retail centers on the south side of Grand through Surprise northwest of Bell Road. Some of these walkways are detached and meandering, a landscaping feature that diverts pedestrians from a direct path of travel.

2. Railroad track crossings. Railroad trackway parallels Grand Avenue for the length of the corridor. All intersecting streets cross these tracks, and all the crossings are protected with crossing arms. However, the condition of the walkway surfaces at these crossings varies from wooden railroad ties to rubber matting. Only one crossing at 107th Avenue has been improved for pedestrians. This crossing is concrete trackway on one side of the roadway, with a 5-foot walkway.

3. Community walls that prevent direct connections. The large planned communities were designed to limit access to a few points. This design inhibits pedestrian movements from one community to neighboring communities and pedestrian facilities.

4. Channelized right turns that lengthen intersection crossings. Lane configuration on Grand Avenue and intersecting streets, counting dedicated and channelized right turns as well as single and double left turns, create conflicts between turning cars and crossing pedestrians. A channelized right turn promotes free flow right turns, often confusing the pedestrian as to when crossing is safe. Protected left turn signal phasing can confuse pedestrians as to when it is safest to cross.

5. No access to planned non-motorized travel routes. The West Valley Multi-Modal Corridor intersects Grand Avenue along this section. The corridor is planned as an interconnecting rail system, linking several jurisdictions along the Agua Fria and New Rivers. There is currently no direct connection or identification of the system along the Grand Avenue Corridor where it crosses the New River bridge.

6. Long distances between destinations. The distances between destinations are often well beyond the 5 to 10 minute walk (800 to 1,400 feet) commonly associated with pedestrian areas. Commercial destinations, however, are common on most of the major intersecting streets; some are located adjacent to residential areas. Some commercial areas are not directly connected via a walkway from major adjoining streets to their front doors. The pedestrian often is left to cross large areas of parking to reach business establishments.

7. Little or no shade. A pedestrian in the desert needs shade in order to make the trip bearable for any distance, especially from May through October. The recommendation for shade on walkways in the region is 50% of the walkway surface shaded in the hottest time of the year. Lack of shade trees along Grand Avenue and intersecting streets is commonplace, even along existing walkways.

8. Narrow existing sidewalks next to traffic. Most of the walkways in the corridor were built to the minimum MAG standard, which is an attached sidewalk, measuring 5 feet from back of curb to back of walk. Given the traffic volume, these facilities are inadequate for pedestrians to feel comfortable and safe walking for any distance.

9. Wide roadways difficult to cross. Given the number of lanes for through travel and turning movements, especially on Grand Avenue itself, crossing distances have become long distances for pedestrians to cross during the allotted traffic signal timing phase. The crossing distance is a safety factor, especially if the population travels more slowly than the average person. This condition is likely, given the average age of the population in this corridor.

These impediments, except for the railroad crossings, are common in the MAG region. The more fundamental question is where there is a need for pedestrian facilities that is not being met.

7.2.2 MAG Pedestrian Plan

The MAG Pedestrian Plan 2000 outlines a methodology for determining the latent demand for pedestrian facilities. The Pedestrian Plan evaluates where the need is greatest in the region, under existing conditions and for the year 2020, by applying a formula to determine the latent demand. The formula incorporates such variables as non-linked pedestrian activity by trip purpose, linked activity and captive activity. Exhibit 7.2 shows the four pedestrian activity area types defined in the Pedestrian Plan.

Exhibit 7.2
Pedestrian Activity District Classifications

Area Type Classification	Latent Demand Percentage	Description
District (upper quintile of major roadway segments in MAG region)	80%-100%	Represents areas of high intensity with a wide variety of land uses that have a regional appeal. Minimum desirable pedestrian Level of Service = A.
Campus (fourth quintile)	60%-79%	Represents high intensity areas with a single or limited mix of land uses. Minimum desirable pedestrian Level of Service = B.
Community (third quintile and fourth decile)	30%-59%	Represents areas of low to medium intensity. Minimum desirable pedestrian Level of Service = C.
Neighborhood (lower three deciles)	0%-29%	Represents areas of low intensity with a limited mix of land uses. Minimum desirable pedestrian Level of Service = C.

Within the Grand Avenue Northwest corridor, the following streets that cross Grand Avenue received composite ratings for Pedestrian Trip Activity in Figure 4-8 of the MAG Pedestrian Plan 2000. Grand Avenue was not rated in the MAG Pedestrian Plan because of its lack of pedestrian facilities. The ratings give some indication of the potential use of these streets by pedestrians.

1. 107th Avenue (south) 50 – 60%
2. 107th Avenue (north) 60 – 70%
3. El Mirage Road 10 – 20%
4. Bell Road (west) 10 – 20%
5. Bell Road (east) 40 – 50%
6. Sunrise Boulevard 9% or less
7. RH Johnson Boulevard 30 – 40%
8. Thunderbird Road (east) 30 – 40%

These ratings reflect the latent demand for pedestrian activity. Defined similarly as in traffic demand modeling, latent demand means that there would potentially be pedestrians using these roadways, assuming no inhibitions to travel except distance. The above-listed routes serve areas in which pedestrians could reach attractors or generators of activity.

For instance, 107th Avenue north of Grand Avenue has a rating of 60-70%. This route is in the second highest category of potential to serve pedestrians. 107th Avenue has destinations that can be defined as "high intensity areas with a single or limited mix of land uses…" that attract

pedestrians. Boswell Memorial Hospital is an example of such a high-intensity land use near this portion of 107th Avenue.

For purposes of this study, this information can help provide insight into latent crossing demand at Grand Avenue intersections throughout the corridor. The above list implies that 107th Avenue, Bell Road and RH Johnson/Thunderbird Road may experience the greatest volume of pedestrians. (El Mirage Road does not cross Grand Avenue at this time.) Therefore, these crossings will need the most attention when future roadway improvements are made. All intersecting streets should be evaluated for safe railroad track crossing and ADA accessibility.

To determine whether pedestrians would actually use these routes, the Roadside Pedestrian Condition Model was applied. This is a scientific method for determining pedestrians' sense of comfort while walking along a given roadway. The model accounts for several measurable traffic and roadway variables such as lateral separation between pedestrians and vehicles, average daily traffic (ADT), speed of traffic, percent of trucks, number of travel lanes, and other features such as landscaping, all of which affect whether people will walk the route. The model establishes a Level of Service to determine how well the roadway performs for pedestrians.

According to the model results, the desired Level of Service (LOS) for routes within the Study Area ranges from LOS B to LOS C. However, local jurisdictions can choose to meet a higher standard due to other factors.

As an example, 107th Avenue has an existing rating of F. The Pedestrian Plan gives designers options for improving the walking environment, particularly with regard to the sense of safety or comfort afforded to pedestrians.

Based on latent demand and the type of roadway, traffic characteristics and land uses adjacent to 107th Avenue, this roadway should meet a minimum standard of LOS C: Community Level. Bell Road and RH Johnson/Thunderbird should also meet a minimum service level of C.

Grand Avenue received a rating of F. There are several factors in addition to comfort and safety for the pedestrian that require consideration before establishing whether there is a need to establish a pedestrian corridor where currently none exists. To determine the need for such a corridor along Grand Avenue where none exists today, the following questions must be addressed:

1. What are the likely destinations for pedestrians? What would be the purpose of the trip – recreation? Fitness? Or other?

2. Who will use the facility? Should the path be a shared use (with bicycles) facility?

3. Are the distances to be traveled reasonable for pedestrians to cover in an urban environment?

4. What improvements, such as shade trees and other amenities, need to accompany placing a new walkway along this section?

5. Will the improvement of this section of roadway for pedestrians also have the potential to serve other community needs, such as aesthetic improvement to the corridor?

6. How will the facility be accessed from local neighborhoods and streets?

7.2.3 Elderly Mobility Initiative

In 2001, MAG initiated a planning effort to understand how the dramatic increase in the number of senior Americans will affect the region. This initiative and its findings have direct applicability to the Grand Avenue Northwest Corridor because the corridor serves a number of age-restricted communities. Youngtown, Sun City, Sun City West, and Sun City Grand are all centers of retirement-age individuals. A 30-member MAG Working Group has been conducting discussions with community groups regionwide to develop a Regional Action Plan on Elderly Mobility that focuses on safety, accessibility, affordability, and independence.

According to recent statistics, by 2010 (the planning horizon for this study), elderly drivers will account for 11% of total annual mileage for all drivers in the United States. By 2030, 20% of all drivers in the United States will be seniors.

Nationally, among persons over 65, 7% of men and 9% of women walk as a means of transportation in urban areas. We expect to see dramatic increases in the elderly population in coming years, at the same time that the elderly are seeking ways in which to "age in place." A recent analysis of elderly perception and reaction at signal-controlled crosswalk intersections documents a 31% rise in elderly pedestrian accidents from 1998 to 1999. After analyzing accident data, the study offers some important facts in designing infrastructure. Many of the following statements apply equally to physically challenged persons of all ages.

- Differences in perception/reaction time, acceleration rate and steady state walking velocity indicate that 6% of the elderly are unable to complete the crossing before opposing traffic obtained a green light;
- Decreased cognitive, sensory and motor abilities as well as decreases in physical strength and structure place the elderly at higher risk of death as a result of an accident;
- Pedestrians 51 and older tend to stand farther away from the curb;
- Elderly females are the most at-risk group for pedestrian/vehicle accidents;
- Elderly pedestrians aged 55 to 74, especially women, tend to overestimate the traveling speed of the vehicle at low speeds and to underestimate at higher speeds;

- Elderly pedestrians have trouble negotiating crosswalks and busy intersections because of the variability, speed, and complexity of traffic situations, leaving them with feelings of anxiety and stress due to a reduction in cognitive function;
- Elderly pedestrians often show behavior patterns that are evasive, withdrawing and indicative of passive resignation;
- Walking speeds range from a low of 1.16 meters/second to 1.4m/s (3.8 feet/second to 4.5 f/s) for both males and females over the age of 60. In another study, speeds ranged from 1.23 to 1.5 m/s (4.0 f/s to 4.9 f/s) for those from 60 to 80 years old; this is 18% to 28% lower than among the general pedestrian population;
- Curb delay, distance from the curb, height of the curb, functional ability, psychological differences, and use of ambulation assistance devices are all factors to consider beyond walking velocity; and
- Designing crosswalks and signal controls for areas with a higher percentage of elderly should be done with a great deal of caution and consideration for the special needs of the elderly.

The Elderly Mobility study is in the process of finalizing recommendations for the region. When the recommendations become available, a review of their applicability to this study will be conducted.

7.2.4 Summary of Pedestrian Deficiencies and Needs

Exhibit 7.3 summarizes existing deficiencies of and impediments to pedestrian travel. It also identifies the needs arising from these impediments and deficiencies.

Exhibit 7.3
Summary of Pedestrian Needs

Facility/Location	Pedestrian Travel Impediment or Deficiency	Need
Grand Avenue, virtually entire length of corridor	Lack of curbs and sidewalks.	Curbs and sidewalks.
All railroad crossings along Grand, except at 107th Avenue	Walkway surface types and conditions vary; crossings have not been improved for pedestrians.	Railroad crossings need to be safe and accessible for pedestrians.
Grand Avenue through much of the corridor	Continuous walls separate the corridor from adjacent neighborhoods.	Connections between walled communities and pedestrian routes may be needed, although acceptability to property owners is an issue.

Exhibit 7.3
Summary of Pedestrian Needs

Facility/Location	Pedestrian Travel Impediment or Deficiency	Need
Selected locations	No access exists to planned recreation/non-motorized travel routes.	Future connections to the West Valley Multi-Modal Corridor need to be planned.
Entire corridor	Destinations specifically along Grand Avenue and generally within the corridor are too far apart for convenient walking.	Transit services may mitigate long walk distances and development guidelines need to cater to pedestrian as well as auto access.
Grand Avenue through much of the corridor	Little or no shade exists.	Opportunities for streetscape treatments and plans for shade to enhance pedestrian comfort need to be formulated.
Various streets that serve the corridor	Sidewalks are narrow and immediately adjacent to motorized traffic.	Pedestrian safety and comfort need to be considered in improving connections to adjacent streets.
Grand Avenue and major intersecting streets	Wide streets are difficult to cross quickly, especially for slower walkers (e.g., many seniors).	Consider geometric and traffic design options to facilitate pedestrian crossings, such as pedestrian ITS at selected locations.

7.3 BICYCLE CIRCULATION

In recent years, bicycles have increasingly been recognized as an important component in an effective multimodal transportation system, both nationwide and within the MAG region. Many of MAG's member jurisdictions, including MCDOT, which is responsible for roadways in Sun City and Sun City West, have developed bicycle plans and constructed on-street and off-street bikeways. Among other jurisdictions in the Grand Avenue Northwest Corridor area, the City of Surprise has included several policies to further the objective of a connected bicycle network in its General Plan 2020. MAG has adopted both a Regional Bicycle Plan (revised January 1999) and a Regional Off-Street System Plan (February 2001).

The following bicycle-related needs were identified at the agency/community forums and September 2000 open house.

- Improve aesthetics of the corridor.
- Construct grade-separated crossings of Grand Avenue and the railroad.

- Improve traffic operations at intersections.
- Improve safety within the corridor.
- Enhance alternative mode travel within the corridor.
- Develop recreational trails, including routes along the dry river beds.
- Provide alternative routes for cyclists.

On Grand Avenue, as on all arterial streets in the region, bicycles are permitted to share the right travel lane with motor vehicles. This is expected to continue if Grand Avenue becomes an enhanced arterial with both grade separations and signalized intersections. Neither Grand Avenue nor its intersecting streets in the study area currently have any special provisions for cyclists.

From SR 101L to 111th Avenue, both sides of Grand Avenue have edge stripes but generally very narrow shoulders. The shoulder widths are often less than the 4 feet specified in the American Association of State Highway & Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* as the minimum necessary to accommodate bicycle travel, when shoulders are intended to be used for this purpose. (AASHTO recommends greater widths where automobile speeds exceed 35 mph, and MCDOT specifies a minimum width of 6 feet on urban principal arterials.) As a result, cyclists must share the right lane with high-speed motorized traffic on Grand, creating potential safety hazards and possibly discouraging bicycle travel.

This situation is exacerbated by the lack of suitable alternative or parallel routes. Bell Road, the nearest alternative, is a poor route for bicycles because of its relatively narrow lanes, greater traffic congestion, absence of shoulders, and lower speed limit (in Sun City, outside the study corridor) that allows golf carts to share the road.

From 111th Avenue to SR 303, Grand Avenue has much wider shoulders. Here the typical shoulder width is 6 to 10 feet, except at signalized intersections. However, AASHTO recommends wide curb lanes or bicycle lanes rather than shoulders under urban conditions.

The MAG Regional Bicycle Plan sets forth many goals and objectives for bicycle travel in the region. Those most pertinent to this study include the following:

> "Provide intermodal connections and connections across city boundaries." (Grand Avenue is one of the principal regional arterials providing such connections.)
>
> "Provide a variety of facility types, with a focus on bicycle lanes and paths."
>
> "Restripe existing roadways, when feasible, to gain space for bike lanes or edgeline buffer zones. Widen curb lanes during reconstruction or repaving to provide space for

bike lanes or edgeline buffer zones. Include bike lanes in all new arterial roadway construction."

"Develop multi-use pathways that are connected with street system pathways and that provide access to local and regional destinations. Provide grade separations such as bridges and tunnels to maintain connectivity of bikeways over barriers such as canals, freeways, *high volume arterial streets*, etc." (Emphasis added.)

"Remove or alleviate barriers to safe bicycle travel, such as substandard arterial freeway crossings, parallel drain grates, *railroad crossings*, asphalt ridges, curb lane choke points, etc." (Emphasis added.)

The MAG Regional Bicycle Plan 1999 Update proposed a bikeway facility on Grand Avenue along the entire length of the study corridor. The type of facility is not specified, and there are no current funds for implementation.

The following additional facilities that would connect with Grand Avenue appear in the MAG Regional Bicycle Plan:

- Bell Road, 99th Avenue to Cotton Lane (as "neither existing nor planned")
- 99th Avenue/Lake Pleasant Road, Glendale Avenue to Carefree Highway (as "neither existing nor planned")
- Litchfield Road, Bell Road to Camelback Road (as "neither existing nor planned")
- Proposed multi-use paths along the New River, Agua Fria River and Beardsley Canal

The MAG Regional Off-Street System Plan (ROSS) is the primary regional planning document for non-motorized paths and trails in existing corridors such as rivers, washes, canals, railroads and utility lines. The Off-Street System Plan identifies several potential routes crossing the Grand Avenue Northwest Corridor, including the New and Agua Fria rivers. Creating access between these future routes and Grand Avenue is a need that will have to be addressed.

Objectives from the ROSS that are especially pertinent to this study include the following:

"Design an off-street path/trail system that provides a sufficient number of access points to provide access to numerous users."

"Connect origins and destinations with continuous and direct off-street routes to support non-motorized travel."

"Provide grade separations to maintain connectivity of paths/trails over barriers such as freeways and high-speed, highly traveled roadways."

"Link the off-street non-motorized transportation system with the on-street system (such as bicycle lanes and wide outside lanes along arterial streets) and other modes of transportation (such as bus routes, light rail and park-and-ride lots) to optimize opportunities for travel by bicyclists and pedestrians."

Both MCDOT and the City of Surprise operate and maintain roads that cross Grand Avenue within the study corridor. Hence it is important to consider key objectives and policies of the two jurisdictions that relate to the Grand Avenue Northwest Corridor Study. These include the following:

MCDOT (from 1999 Bicycle Transportation System Plan)

"Establish roadway cross sections with bicycle lanes as the Maricopa County roadway design standard."

"MCDOT shall include bicycle facilities on all County roadways as described in the *Roadway Design Manual* and *Pavement Marking Manual*." (These guidelines call for bicycle lanes on all newly constructed and reconstructed arterials.)

"Bicycle projects not directly combined with a larger roadway project shall be evaluated separately during the CIP process."

"The CIP shall rate projects with bicycle elements higher than projects without bicycle elements."

"Partners, contractors and customers of MCDOT are to be informed of the position of the County towards bicycle transportation and encouraged to follow the same standards and principles when working with the County."

Surprise (from General Plan 2020)

"Develop an area-wide plan for the improvement and maintenance of a sidewalk/trailway system throughout the planning area."

"Provide on-road bicycle lanes on all arterials throughout the City of Surprise planning area."

"Bikeway projects not directly combined with a larger project shall be evaluated separately during the Capital Improvement Program (CIP) process."

Exhibit 7.4 lists bikeways proposed by MAG, MCDOT and the City of Surprise that would serve the Grand Avenue Northwest Corridor. The jurisdiction(s) responsible for each project are shown in italics. North-south facilities are listed in order from east to west, while east-west facilities are listed from south to north."

Exhibit 7.4
Proposed Bikeway Facilities, Grand Avenue Northwest Corridor

Location/Jurisdiction	Facility Type	Source
Grand Avenue, Van Buren Street-SR 74 (includes entire length of study corridor). *ADOT*	Unspecified	MAG Regional Bicycle Plan (January 1999)
Along north Surprise city limit, approximately Dysart/Bell Road-BNSF Railroad; then along BNSF Railroad right-of-way, approximately Litchfield Road-SR 303L. *Surprise*	Off-street multi-use path	Surprise General Plan 2020
New River alignment, Skunk Creek-Agua Fria River. *Multi-agency*	Off-street bikeway or multi-use path	MAG Regional Bicycle Plan, West Valley Multi-Modal Corridor Plan
99th Avenue, Beardsley Road-Olive Avenue. *Maricopa County*	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan (May 1999)
103rd Avenue, Boswell Boulevard-Grand Avenue. *Maricopa County*	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
Agua Fria River alignment, CAP Canal-Gila River. *Multi-agency*	Off-street bikeway or multi-use path	MAG Regional Bicycle Plan
El Mirage Road, Deer Valley Road-Bell Road. *Maricopa County*	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
El Mirage Road, Bell Road-Paradise Lane. *Surprise*	Bike lanes	Surprise General Plan 2020
Dysart Road, Bell Road-Greenway Road. *Surprise*	Bike lanes	Surprise General Plan 2020
Litchfield Road, Bell Road-Camelback Road. *Maricopa County, Surprise, Glendale*	Bike lanes or edge line buffer zones	MAG Regional Bicycle Plan
Reems Road, Grand Avenue-Peoria Avenue. *Surprise, Maricopa County*	Bike lanes	Surprise General Plan 2020
Thunderbird Road, Peoria City Limit-99th Avenue. *Maricopa County*	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan

Exhibit 7.4
Proposed Bikeway Facilities, Grand Avenue Northwest Corridor

Location/Jurisdiction	Facility Type	Source
Waddell Road, Dysart Road-Cotton Lane. *Maricopa County, Surprise*	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
Greenway Road, Grand Avenue-Trilby Wash Basin. *Surprise, El Mirage, Maricopa County*	Bike lanes	Surprise General Plan 2020
Bell Road, 99th Avenue-Grand Avenue. *Maricopa County, Surprise*	Bike lanes or edge line buffer zones	MAG Regional Bicycle Plan
Bell Road, Grand Avenue-Sun Valley Parkway. *Surprise*	Edge line buffer zones	MAG Regional Bicycle Plan
Mountain View Boulevard, Parkview Place-Sunrise Boulevard. *Surprise*	Bike lanes	Surprise General Plan 2020
SR 303L, Waddell Road-Lake Pleasant Road.* *Maricopa County, Surprise*	Bike lanes	MCDOT Bicycle System Plan

*If SR 303L becomes a freeway, an alternative facility must be found.

Exhibit 7.5 summarizes bicycle transportation needs in the Grand Avenue Northwest Corridor. This table specifies which needs emerged through the agency/public input process and which were identified by other means. Recommendations for the Grand Avenue Northwest Corridor will be addressed in Chapter 8.

Exhibit 7.5
Summary of Bicycle Transportation Needs

Need	Source
Improved riding conditions for cyclists along the Grand Avenue Corridor from SR 101L to SR 303L.	MAG Regional Bicycle Plan, agency/public input, field observation
Grade-separated crossings of Grand Avenue and the railroad.*	Agency/public input, MAG Bicycle Plan, BNSF
A more direct route across Grand between El Mirage and Surprise CBDs.	Field observation and analysis
Recreational trails, including routes along the river beds.*	Agency/public input
Convenient access between Grand Avenue Corridor and future off-street paths or trails, especially the West Valley Multi-Modal Corridor.	MAG Bicycle Plan, ROSS, field review
Bikeway connections between Grand Avenue and other major roadways linking activity centers.	MAG Bicycle Plan, field observation
A continuous, interconnected bicycle network crossing jurisdictional boundaries.	MAG Bicycle Plan, other jurisdictional plans
Physical improvements to some railroad crossings.*	Field review
Enhanced aesthetics, comfort and amenities for bicyclists in the corridor.	Agency/public input, field review

*Also applies to pedestrians.

7.4 ELECTRIC CART CIRCULATION

Numerous adult and retirement communities have been developed in Maricopa County, especially the Northwest Valley, during the last 40 years. Often built around golf courses with clubhouses and recreation centers, these communities promote a lifestyle that encourages the wide use of golf carts as everyday means of transportation. Among these communities, Sun City, Sun City West and Sun City Grand all lie largely within the Grand Avenue Northwest Corridor. Sun City Grand, the newest of the three Del Webb communities, is in Surprise; the others lie within unincorporated Maricopa County. Youngtown also has a high proportion of seniors and retirees. During a recent visit to the corridor, many golf carts were observed on the street system, particularly in Sun City West and Sun City Grand. Most of the golf carts operating in the Northwest Valley are electrically powered, neighborhood electric vehicles (NEVs).

Traveling to and from the golf course is only one of the many reasons people drive electric carts. Several years ago, MCDOT conducted a survey of golf cart users. The results indicated that owners of golf carts use them often and to do everything that they would normally do with an automobile, such as visit friends, go to the store and run errands.

On most streets in adult communities, electric carts and automobiles share the road successfully. Anyone using a motorized cart on a public road must be a licensed driver, however. Arizona law (ARS §28-966) restricts neighborhood electric vehicles as follows:

1. A neighborhood electric vehicle shall not be operated at a speed of more than 25 mph.

2. A neighborhood electric vehicle shall not be driven on a highway that has a posted speed limit of more than 35 mph. This subsection does not prohibit a neighborhood electric vehicle from crossing a highway with a speed limit higher than 35 mph at an intersection.

3. A neighborhood electric vehicle shall have a notice of the operational restrictions applying to the vehicle permanently attached to or painted on the vehicle in a location that is in clear view of the driver.

The second of these restrictions precludes the operation of carts on Grand Avenue, Bell Road and 99th Avenue within the study corridor. Grand Avenue has a speed limit of 45 mph in most of the corridor, while Bell Road and 99th Avenue have speed limits of 40 mph in the vicinity of Grand Avenue. As a result, the primary golf cart crossings of Grand Avenue are located at 103rd, 107th/Del Webb, 111th and 113th Avenues in Sun City/Youngtown; and at Reems Road/Meeker Boulevard and Sunrise/RH Johnson Boulevard in Sun City West/Sun City Grand.

No county ordinances or MCDOT policies currently govern the use of electric carts on public roads in Sun City and Sun City West, which are located in unincorporated Maricopa County. MCDOT's main concern has been to attempt to provide for safe crossings of major streets, where necessary, on a case-by-case basis.

The need for electric carts to reach destinations by crossing major roads makes for potentially hazardous situations, as does the use of carts to cross over into areas that are not signed or built to accommodate them. In Sun City Grand, special cart crossings have been signed and striped on streets that cross golf courses.

The goals listed below were included in MCDOT's Northwest Valley Transportation Study, which covered the Grand Avenue Northwest Corridor and included participation from six cities and towns. The MCDOT study was not approved or adopted by the MAG Regional Council. The MCDOT study will be superseded by the MAG Northwest Area Transportation Study currently in progress.

- Neighborhood and homeowners' associations, with assistance from the transportation department of the appropriate jurisdiction, should identify a safe circulation network for golf carts;

- Education efforts on safe and legal golf cart use should be developed and supported; and
- Efforts should be made to find safe and efficient alternatives to heavily traveled, major roadways that provide direct links to desired destinations such as shopping centers.

Electric carts are not permitted to use bike lanes, but they may share wide outside lanes and striped shoulders so long as they are not signed for bicycle use. The need to accommodate golf carts is one reason why MCDOT has not yet developed the planned bike lanes in the Sun Cities listed in Exhibit 7.4.

Exhibit 7.6 lists needs identified in the Grand Avenue Northwest Corridor Study relating to electric cart transportation. Interestingly, NEVs drew less attention during the agency and community involvement process than transit and non-motorized modes.

Exhibit 7.6
Summary of Electric Cart Transportation Needs

Need	Source
A safe and legal route between Sun City and Sun City West.	Field observation and analysis
Additional access between Sun City West and Sun City Grand.	Field observation
Possible signage to warn of golf cart crossings (e.g., of Grand Avenue).	Field observation
Consideration of educational efforts for golf cart riders and other road users in areas with heavy golf cart travel.	MCDOT Northwest Valley Transportation Study
Consideration of golf cart access, mobility and safety as an issue in the MAG Northwest Area Transportation Study.	MAG NW Area Transportation Study
Determination of feasibility of NEVs along off-street corridors.	MAG Regional Off-Street System Plan

8.0 DEVELOPMENT AND EVALUATION OF INVESTMENT OPTIONS

8.1 INTRODUCTION

In order to identify and evaluate a wide range of optional actions for the Grand Avenue Northwest Corridor, three categories of improvements were established:

Roadway Options

Operation and Aesthetic Improvements

Transit and Other Modes

For the most part, improvements in one category are independent of the other categories. As such, options for major roadway improvements can be evaluated independent from transit and other modes as an example. However, in some cases action options in one category may be in conflict with action options in another category. For example, high-speed traffic on a wide highway is not compatible with pedestrian, bicycle, and other slower moving modes. As a result, choices are needed.

The options and concepts presented herein have been developed through a series of public meetings, meetings with local jurisdictions, and agency/community forums. Several of the alternative actions presented in this chapter are direct suggestions from the public and agencies. Other actions were identified by the Maricopa Association of Governments (MAG) and consultant study team based on the major issues, goals and policies presented in Chapter 5, the long-term road needs in Chapter 6, and the alternative mode needs in Chapter 7.

The options have been evaluated considering the full range of evaluation factors including environmental effects, cost, cost-effectiveness, community acceptance, implementation responsibilities, right-of-way and property takes, etc. For brevity and clarity, only those factors that are particularly relevant in the evaluation of a particular option are described in this paper.

8.2 ROADWAY OPTIONS

There were three overall corridor alternatives considered for the Grand Avenue Northwest Corridor: the no-build alternative, enhanced arterial/limited expressway alternative, and full expressway alternative. Each of the alternatives is briefly described below.

No-Build – The no-build concept would leave Grand Avenue as it is and would make no additional improvements within the corridor.

Enhanced Arterial/Limited Expressway – Would widen Grand Avenue to a six-lane arterial street between SR 101L and SR 303L; construct grade separations where warranted and feasible; improve remaining at-grade intersections and provide signal coordination; and consolidate and eliminate some access locations.

Full Expressway – Would construct a full expressway concept with complete access control. A full expressway would have few traffic signals, full access control, and grade separations or interchanges at most cross streets.

Based on input from local agencies and the public at three Agency/Community Forums, a public meeting, and two community outreach meetings requested by community representatives, the enhanced arterial/limited expressway alternative was selected for further refinement and evaluation as part of this study.

The no-build alternative is always an option and is used as a basis for comparison. With increased travel demand in the Grand Avenue Northwest Corridor, the no-build alternative would lead to increasing congestion and delay, and decreasing safety. However, it remains an alternative until a specific funded program of improvements is chosen by the implementing agency or agencies.

Based on responses obtained through the public involvement process and the analyses conducted as part of this project, the full expressway alternative for Grand Avenue was eliminated from further study for the following reasons:

- A full expressway would be very expensive to design and build (over $500 million).
- An additional 100 to 150 feet of right-of-way would be needed at interchanges, and some right-of-way would be needed in other portions of the corridor.
- Many businesses and residences would require relocation including a large percentage of the total commercial/retail businesses in El Mirage, Youngtown, Sun City (south of Grand Avenue), and in Surprise on the southwest side of Grand. Access to many remaining businesses would be altered or reduced.
- Traffic volumes on Grand Avenue would increase up to 150,000 vehicles per day.
- Faster speeds and more truck traffic would be encouraged.
- Railroad grade separations would not necessarily be provided.
- Noise within the corridor would increase.
- The larger highway may increase the barrier effect of crossing Grand Avenue.
- Several new traffic signals have been installed or approved for installation on Grand Avenue which will make it extremely difficult and very disruptive to convert the roadway

into an expressway. Of the 18 existing signals and three proposed signals, at least half would have to be removed to approach expressway standards.

- Between I-17 and SR 101L, a series of grade separations are programmed for construction which would continue traffic signals on Grand Avenue at most locations, which is not consistent with a full expressway.
- The pavement may need to be replaced to accommodate the higher traffic loads.
- SR 303L is being upgraded which may relieve Grand Avenue of some traffic and thereby reducing the need for a full expressway.

The enhanced arterial/limited expressway alternative was refined based on comments received to date. The alternative is comprised of several components based upon the needs identified in Chapter 6. For each component, one or more options were identified and presented at the agency/community forums. A questionnaire on the options was provided to participants at the February 26, 2001 agency/community forum. The recommendations presented in Chapter 9 are based on the input from the Agency/Community Forum and public meetings, potential for funding, and technical issues.

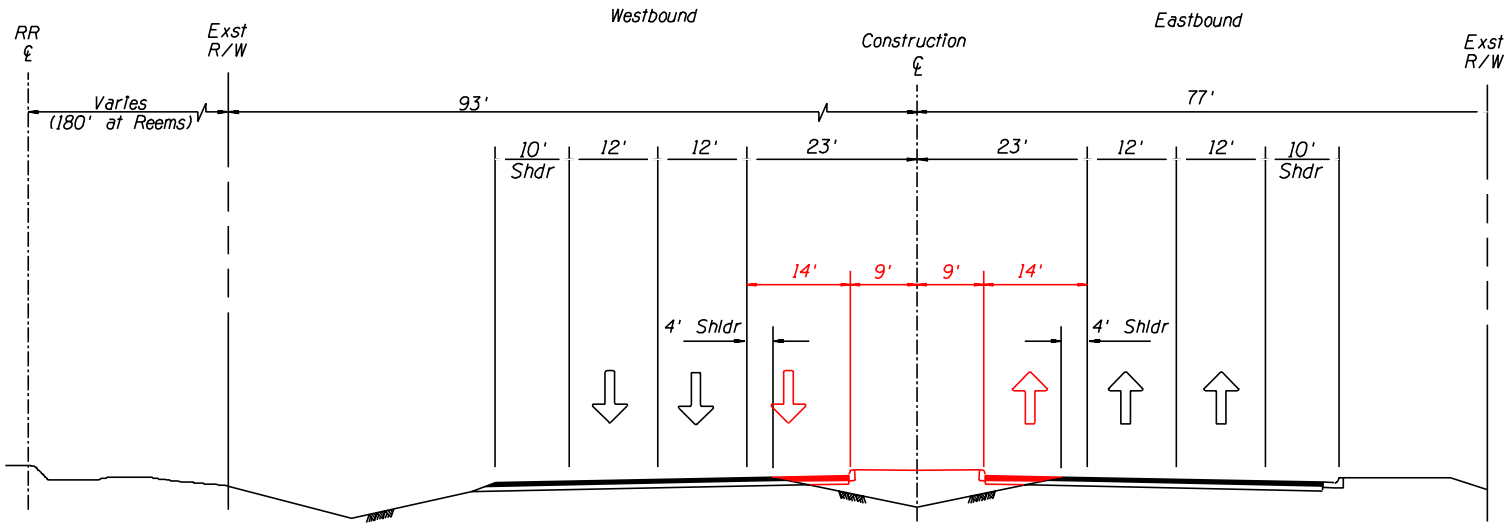
The concepts for improvements have been grouped into the following categories: (1) widen Grand Avenue; (2) add turn lanes on cross streets; (3) grade separations; (4) continuous arterial routes; and (5) access management along Grand. Options in each of these four categories are identified and evaluated below.

General cost estimates for construction and right-of-way are provided for each option. The estimates are based upon 2000 unit prices and have not been inflated for a future year of construction.

8.2.1 Widen Grand Avenue to Six-Through Lanes

Need: ***One of the major needs identified for the corridor is the increasing traffic congestion that is aggravated by the inconsistent number of lanes provided on Grand Avenue. Widening Grand Avenue would address these deficiencies***.

Option A: Grand Avenue would be widened to three 12-foot travel lanes in each direction from SR 101L to SR 303L. A raised median 12 to 18 feet wide would separate the directions of travel. From SR 303L to the Agua Fria River, the widening would be in the median. Between the Agua Fria and New rivers, the widening would be on the outside. A 2-foot inside shoulder or "shy distance" would be provided for curbed medians. A 5-foot outside shoulder would be provided on curbed sections and 10-foot outside shoulders on non-curbed sections. Some reductions in width may be needed where there is limited right-of-way available. Exhibits 8.1, 8.2, 8.3, and 8.4 illustrate proposed typical sections along the corridor. Widening Grand Avenue requires



Proposed Widening

EXHIBIT 8.1
REEMS RD to BELL RD
PROPOSED TYPICAL SECTION
Between Intersections
(looking SE)

GRAND AVENUE
NORTHWEST CORRIDOR STUDY

MARICOPA ASSOCIATION of GOVERNMENTS

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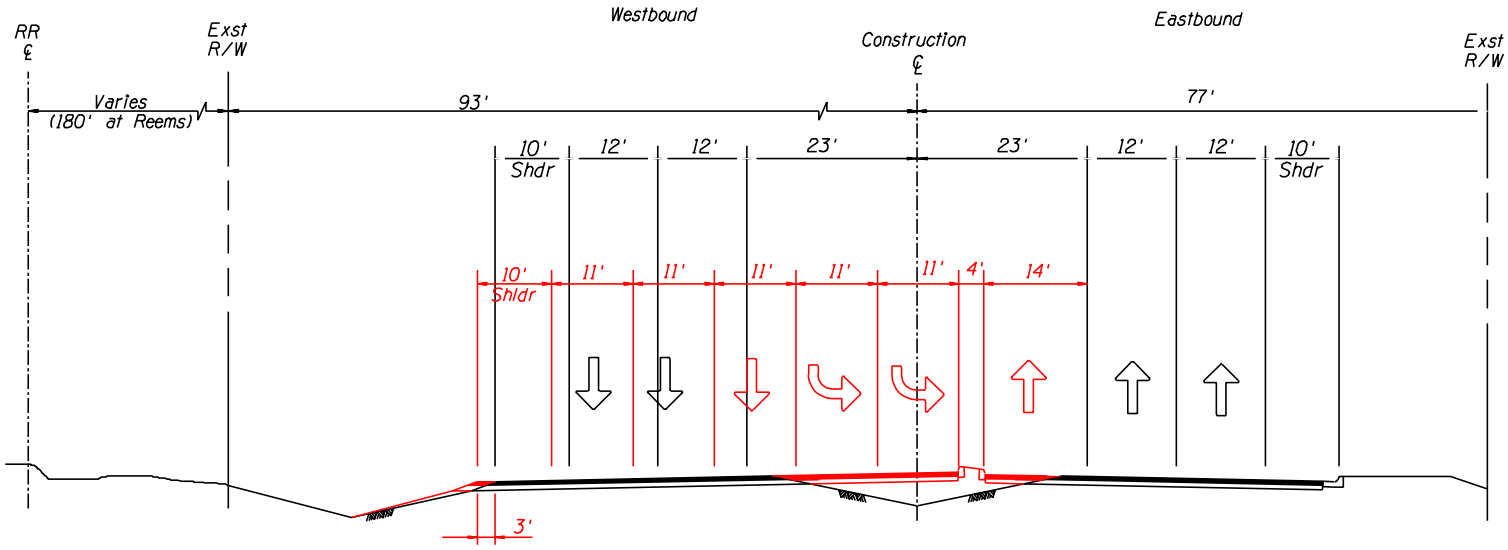

Proposed Widening

EXHIBIT 8.2
REEMS RD to BELL RD
PROPOSED TYPICAL SECTION
w/Dual Left Turn Lanes
(looking SE)

GRAND AVENUE
NORTHWEST CORRIDOR STUDY

MARICOPA ASSOCIATION of GOVERNMENTS

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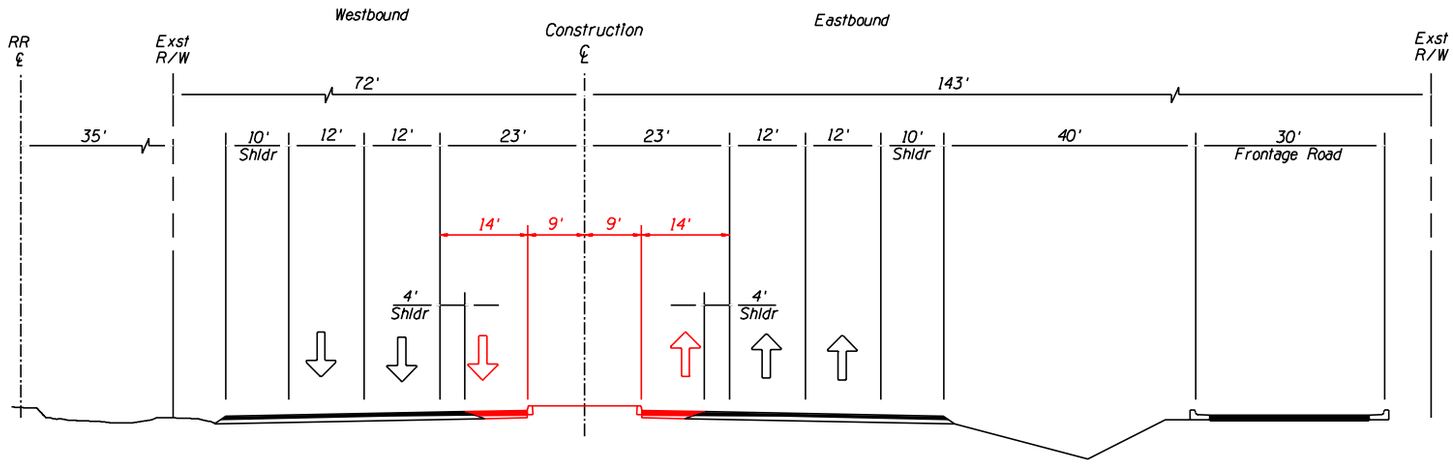

Proposed Widening

EXHIBIT 8.3
DYSART RD to THUNDERBIRD RD
PROPOSED TYPICAL SECTION
Between Intersections
(Looking SE)

GRAND AVENUE
NORTHWEST CORRIDOR STUDY

MARICOPA ASSOCIATION of GOVERNMENTS

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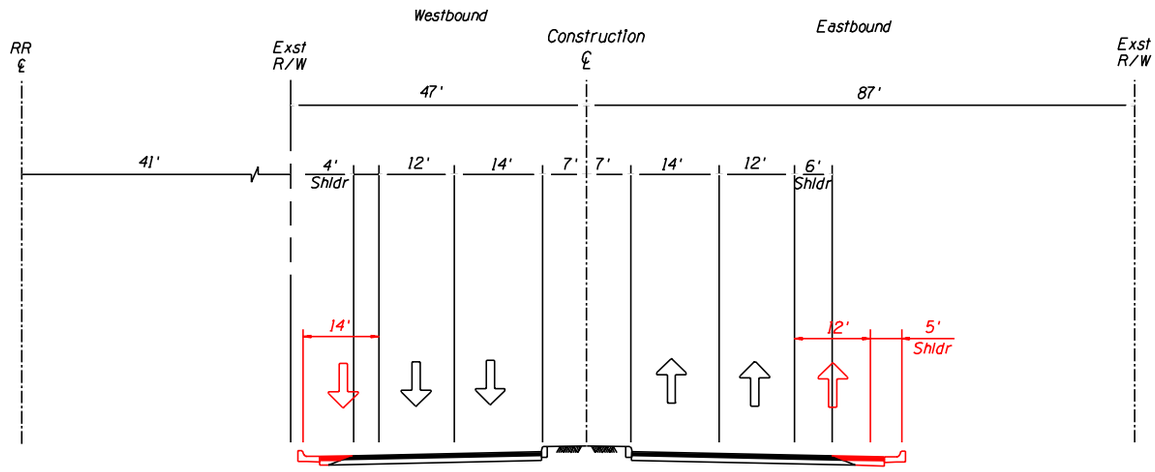

Proposed Widening

EXHIBIT 8.4
EAST and WEST OF 107th AVE
PROPOSED TYPICAL SECTION
(Looking SE)

GRAND AVENUE
NORTHWEST CORRIDOR STUDY

MARICOPA ASSOCIATION of GOVERNMENTS

URS

requires widening/reconstructing the existing bridge over the New River. The Agua Fria River Bridge would not need widening. Dual left-turns lanes in the northwest-bound and southeast-bound directions should be provided on Grand Avenue at the following intersections: 99th Avenue, 107th Avenue, Thunderbird/Thompson Ranch, Bell, and Meeker/Reems. Due to limited right-of-way near 107th Avenue (particularly on the railroad side), the ability to provide dual left-turn lanes is questionable and should be evaluated further. As shown in Exhibit 8.2, some widening will be needed in the outside northwest of the Agua Fria River to accommodate dual left-turn lanes.

For the most part, the widening of Grand Avenue can be accomplished within existing right-of-way. Areas where additional right-of-way might be needed are near 111th and 107th Avenues. Out of the 11.5 miles between SR 101L and SR 303L, 9.6 miles need to be widened. The roadway could be widened in stages to minimize the impacts to access and travel within the corridor. Widening Grand Avenue would increase the distance required to cross Grand Avenue making it more difficult to cross for pedestrians, bicycles and golf carts. The estimated cost to widen Grand Avenue including the bridge over the New River is in the range of $30 million.

Roadway drainage on Grand Avenue throughout the corridor should be evaluated. Stormwater ponding on the roadway was observed west of 99th Avenue. Because of the limited right-of-way, curb and gutter may need to be included on both sides of the roadway and an underground storm drain constructed in the 113th to 99th Avenue section.

Responses from the questionnaires were in strong support of widening Grand Avenue. The widening of Grand and addition of dual left-turn lanes will greatly improve traffic operations within the corridor. The negative impacts associated with this improvement are primarily the increase in pavement width that pedestrians, bicycles and golf carts would have to traverse to cross Grand Avenue. Mitigation measures should be explored during the design process.

8.2.2 Add Turn Lanes on Cross Streets

Need: ***The cross streets that intersect Grand Avenue are also congested. Additional through and turn lanes on the cross streets at the signalized intersections would improve traffic operations and increase capacity. The additional through and turn lanes on the cross streets are proposed to provide level of service (LOS) D or better for year 2025 design volumes. Some turn lanes are proposed to balance opposing traffic lanes that are needed based on the design volumes***.

Option B: Potential lane additions are as follows:

99th Avenue

Add southbound (SB) and northbound (NB) left-turn lanes to create dual left-turn lanes on 99th Avenue.

107th Avenue

Add SB and NB left-turn lanes to create dual left-turn lanes on 107th Avenue.

Thunderbird Road/Thompson Ranch Road

Add SB left-turn lane to create dual left-turn lanes on Thunderbird Road.

Add NB left-turn lane to create dual left-turn lanes on Thompson Ranch Road.

Dysart Road

Widen Dysart Road to provide two through lanes through the intersection in each direction.

Add a NB and SB left-turn lane to create dual left-turn lanes on Dysart Road.

Bell Road

Widen WB Bell to three through lanes through the intersection.

Meeker Boulevard/Reems Road

Add a SB left-turn lane to create dual left-turn lanes on Meeker Boulevard.

Add a NB left-turn to create dual left-turn lanes on Reems Road.

Widening Grand Avenue and providing cross street improvement as described above would allow the Grand Avenue intersections to accommodate the 2025 design volumes at LOS D or better except at two intersections: Bell Road and Greenway Road. These improvements would eliminate many of the operational problems along Grand Avenue. The estimated levels of service in 2025 at the major intersections along Grand Avenue are shown below. LOS D during the peak hours is typical for major intersections in major urban areas. LOS E and F are considered congested. This analysis was based on SR 303L being constructed as a four-lane expressway as currently shown in the MAG long-range plan. Also shown below are the levels of service if SR 303L is built as a freeway. The freeway would divert an additional 15,000 vpd from Grand Avenue in 2025 which would further improve the level of service.

2025 Levels of Service (P.M. Peak)

Intersection	Recommended Improvements with Design Volumes*	Service Levels with SR 303L as Freeway
RH Johnson/Sunshine	D	D
Meeker/Reems	D	C
Litchfield Road	C	C
Bell Road	F	E
Dysart Road	D	D
Greenway Road	E	D
Thunderbird/Thompson Ranch	D	D
111th Avenue	D	D
107th Avenue	D	D
103rd Avenue	D	D
99th Avenue	D	D

* Six lanes on Grand Avenue with additional turn lanes at specified intersections (no grade separations).

The estimated cost to provide the cross street improvements is $9 million. The widening and turn lanes could be accomplished with minimal additional right-of-way and impact to businesses and residences. Traffic restrictions during construction would not severely impact travel or access within the corridor. The cross street improvements provide significant operational improvements with few impacts. Ways to mitigate impacts to alternative modes including pedestrians, bicycles, and golf carts should be considered in the design of turn lanes on cross streets.

8.2.3 Provide Grade Separations at Selected Intersections

In response to citizen concerns about the barrier effect created by Grand Avenue and the railroad tracks to vehicles, emergency vehicles, pedestrians and bicycles attempting to cross Grand Avenue, five locations along Grand Avenue were evaluated as possible locations for grade separations. A grade separation is where one road is bridged over another road so that the through traffic on the two roads do not intersect. The first group of grade separation options would provide improved access to the Boswell Memorial Hospital and the Del E. Webb Memorial Hospital. The second group would provide needed capacity improvements. The third group would help establish a more continuous north-south route across the Grand Avenue corridor. The final location evaluated grade separating the railroad spur with Grand Avenue.

8.2.3.1 Access to Hospitals

Need: Although no documentation has been presented of a life being lost because of access to the hospitals being blocked by a train, there is a general concern from the public that it could occur. On an average day, 12 trains travel between SR 101L and SR 303L. When a train crosses an intersection, it blocks the intersection for up to 210 seconds (based on a train of maximum length = 6,000 feet). The two hospital locations were addressed separately, and several options were considered at each location.

The **Boswell Memorial Hospital** is located on the northeast side of Grand Avenue and the railroad between 107th Avenue and 103rd Avenue. Three alternative grade separations were evaluated to improve access to the hospital: at 107th Avenue, at 103rd Avenue and direct access to the hospital between these two streets.

Option C: **107th Avenue**: An underpass for 107th Avenue below Grand Avenue and the BNSF Railroad, both of which would stay at-grade, would be constructed. The grade separation with the railroad would eliminate the potential of emergency vehicles traveling to and from Boswell Memorial Hospital being blocked by a train. This underpass would also enhance pedestrian, bicycle, golf cart, and general motor traffic movement across the railroad and Grand Avenue. Either a single point urban interchange (SPUI) or a diamond interchange could be constructed at this location.

For either interchange, the narrow existing right-of-way would require Grand Avenue to be realigned to the southwest to make room for the northwest-bound on/off-ramps abutting the railroad right-of-way. Refer to Exhibit 8.5. This interchange would provide direct access to Boswell Memorial Hospital. The existing crossroad skew is approximately 18 degrees at this location. Access to 107th Avenue from adjacent businesses would be disconnected through the depressed section (approximately 1,000 feet on either side of Grand Avenue). Approximately 91 feet of new right-of-way is needed. Refer to Exhibit 8.6. The interchange would likely require the relocation of shopping centers on both sides of 107th Avenue, south of Grand Avenue. There are few other nearby shopping centers for the residents in this area. A temporary detour track for the railroad would need to be constructed to build the underpass.

The cost of right-of-way and construction of an interchange would be between $40 and $45 million and would severely impact businesses and residences. Other than providing a grade separation with the railroad, the interchange is not needed to accommodate traffic design volumes. Therefore, an interchange at this location seems to have more impacts than benefits and is not a cost-effective solution.

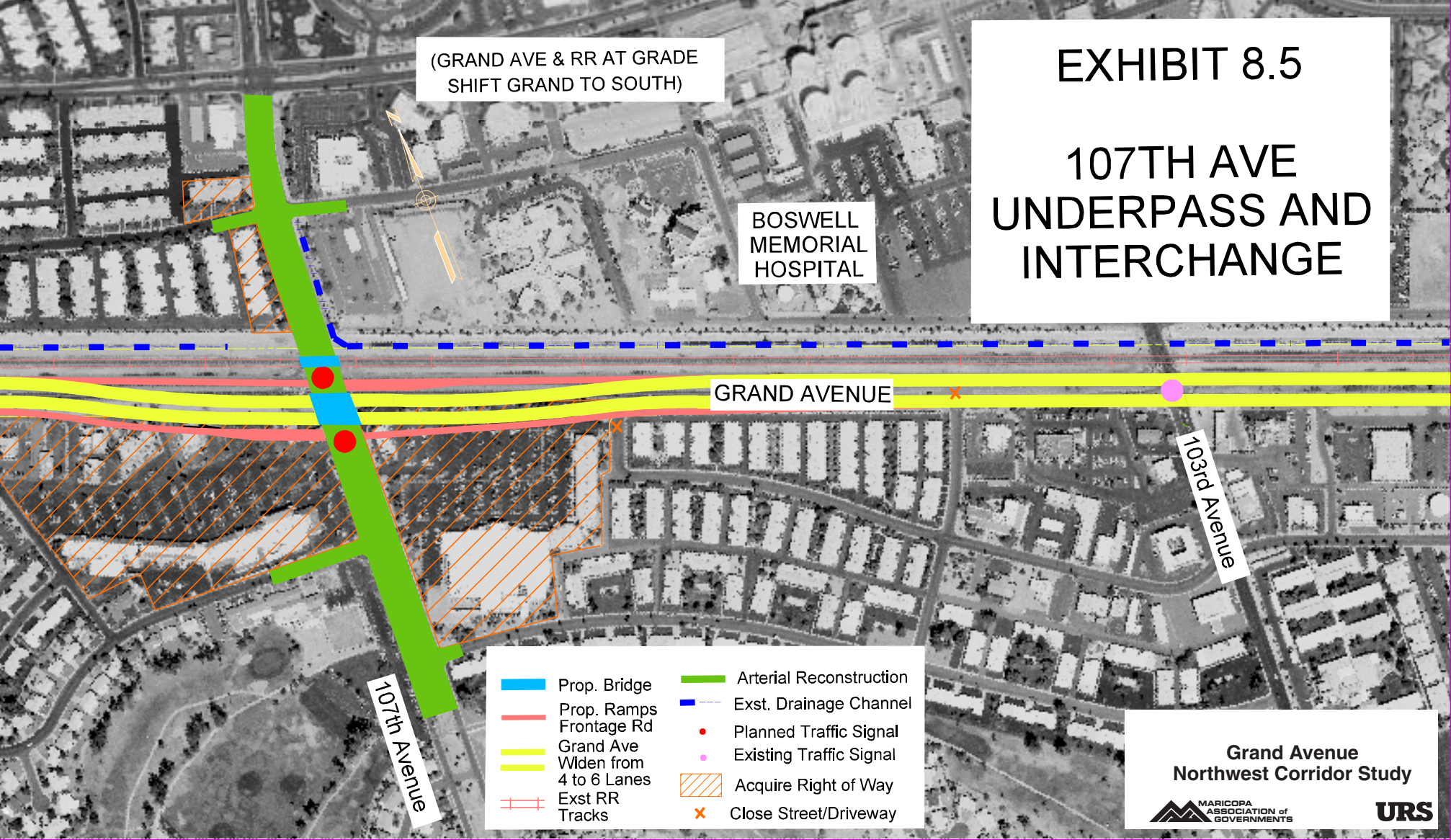

EXHIBIT 8.5

107TH AVE UNDERPASS AND INTERCHANGE

Grand Avenue
Northwest Corridor Study

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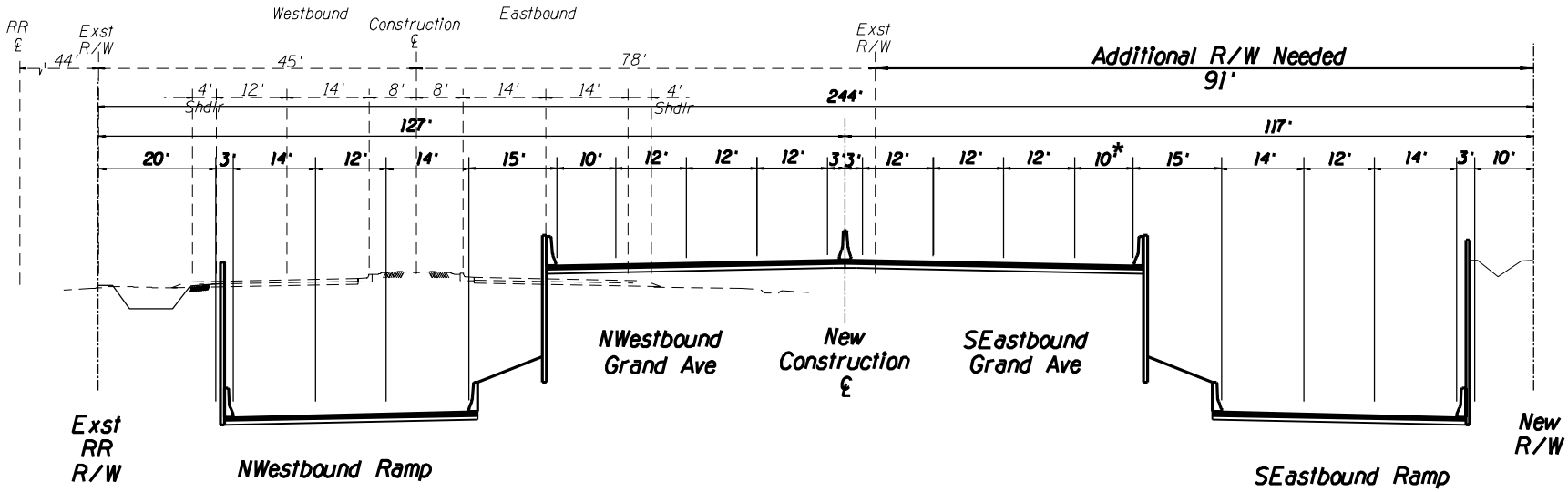
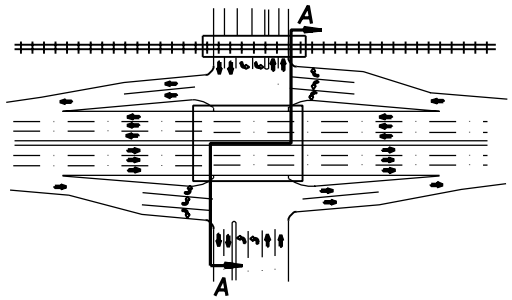




PROPOSED TIGHT SPUI/DIAMOND
PLAN VIEW

Exhibit 8.6
107th Avenue Underpass to Grand Avenue
Cross Section A-A
(looking SE)

*Current ADOT standard is to provide 12′ shoulder next to barrier wall.

Option D: **103rd Avenue**: A grade separation at 103rd Avenue would be an alternative to one at 107th Avenue with the same purpose of providing a grade separation with the railroad to assist emergency vehicles and the movement of pedestrians, bicycles, golf carts, and general motor traffic across the railroad and Grand Avenue. 103rd Avenue would be an underpass below Grand Avenue and the BNSF Railroad, which would both stay at-grade. Refer to Exhibit 8.7. Access to 103rd Avenue from adjacent businesses would be disconnected through the depressed section (approximately 1,000 feet on either side of Grand Avenue). This option is presented as a grade separation, not an interchange. As such, it would be much better for motorized and non-motorized traffic across Grand and the railroad. If ramps were to be added, they would result in additional impacts to businesses fronting Grand Avenue. A shoofly (detour) for the railroad would need to be constructed to build the underpass.

The cost of right-of-way and construction of a grade separation would be approximately $24 million and would severely impact businesses and residences. Other than providing a grade separation with the railroad, the interchange is not needed to accommodate traffic design volumes. Maintaining good access to the hospital during construction may be difficult. The benefit of this grade separation is primarily to link the north and south portions of Sun City and to provide a grade separated link to Boswell Hospital from south of Grand. As a result, this project would require local funding.

Option E: **Emergency-Only Access**: An underpass could be provided under Grand Avenue and the BNSF Railroad located between 103rd Avenue and 107th Avenue. The underpass would provide one-way inbound access to the hospital. A northwest bound off-ramp and a southeast-bound off-ramp from Grand Avenue would be provided. Refer to Exhibit 8.8. Use of the underpass would be for emergencies only.

This alternative would require the hospital to participate as a partner in the project and allow construction on their property. It would also impact a residential area along the southwest side of Grand Avenue. The grade separation would cost approximately $7.5 million for right-of-way and construction.

Responses to the questionnaires were in favor of a grade separation to improve access to Boswell Memorial Hospital. Sunhealth Systems, owners of both hospitals, indicated that improved emergency access to Del E. Webb Hospital was more critical than Boswell Hospital because of the number of access routes currently available to Boswell. All of the alternatives will be expensive, require the relocation of residential and commercial property, and will disrupt traffic during construction. If the Hospital becomes a partner to the emergency only access, that option might be feasible. However, the availability of ADOT highway funds for such as access point is questionable.

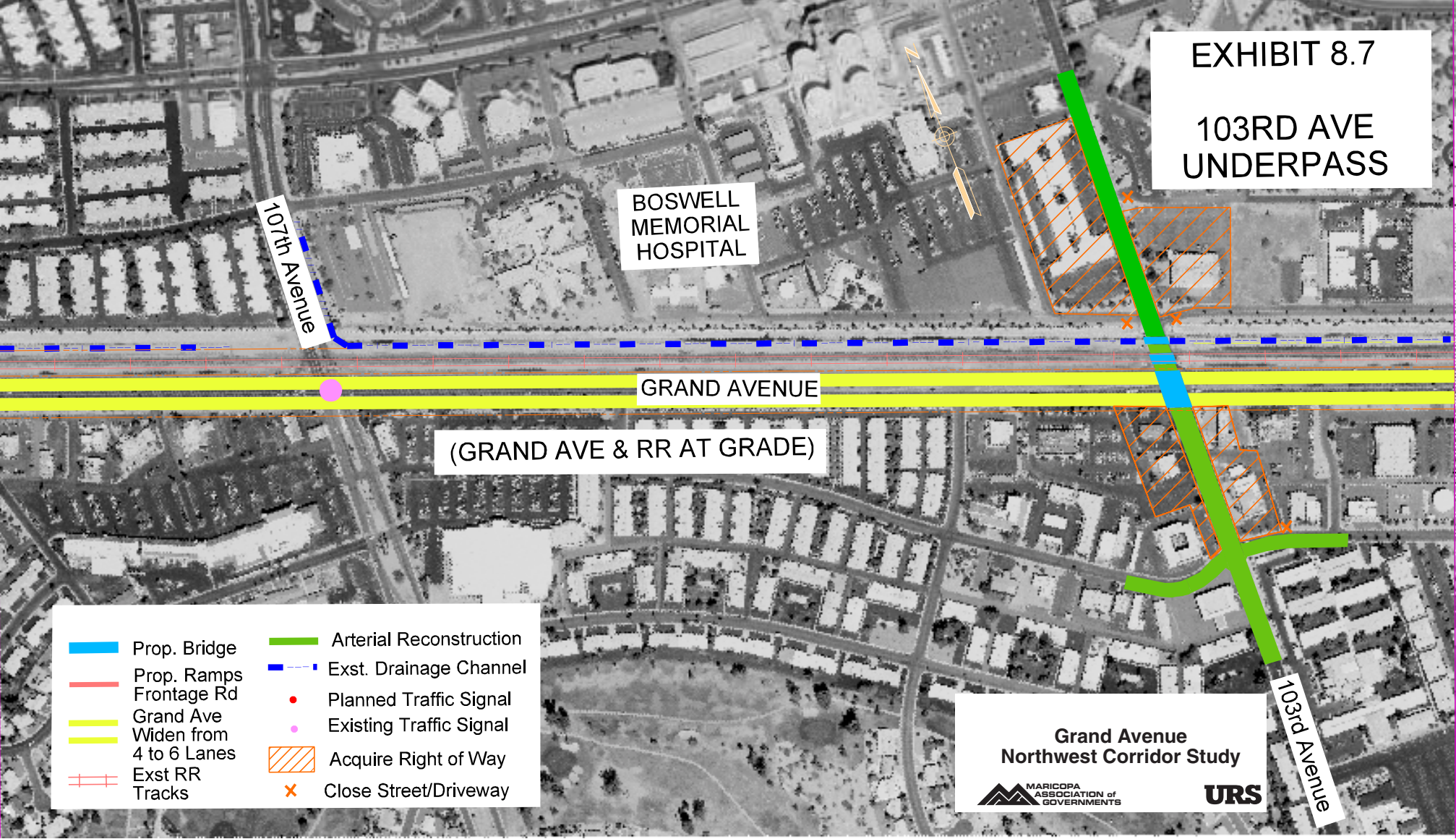


EXHIBIT 8.7
103RD AVE UNDERPASS
BOSWELL MEMORIAL HOSPITAL
107th Avenue
GRAND AVENUE
(GRAND AVE & RR AT GRADE)
103rd Avenue
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS

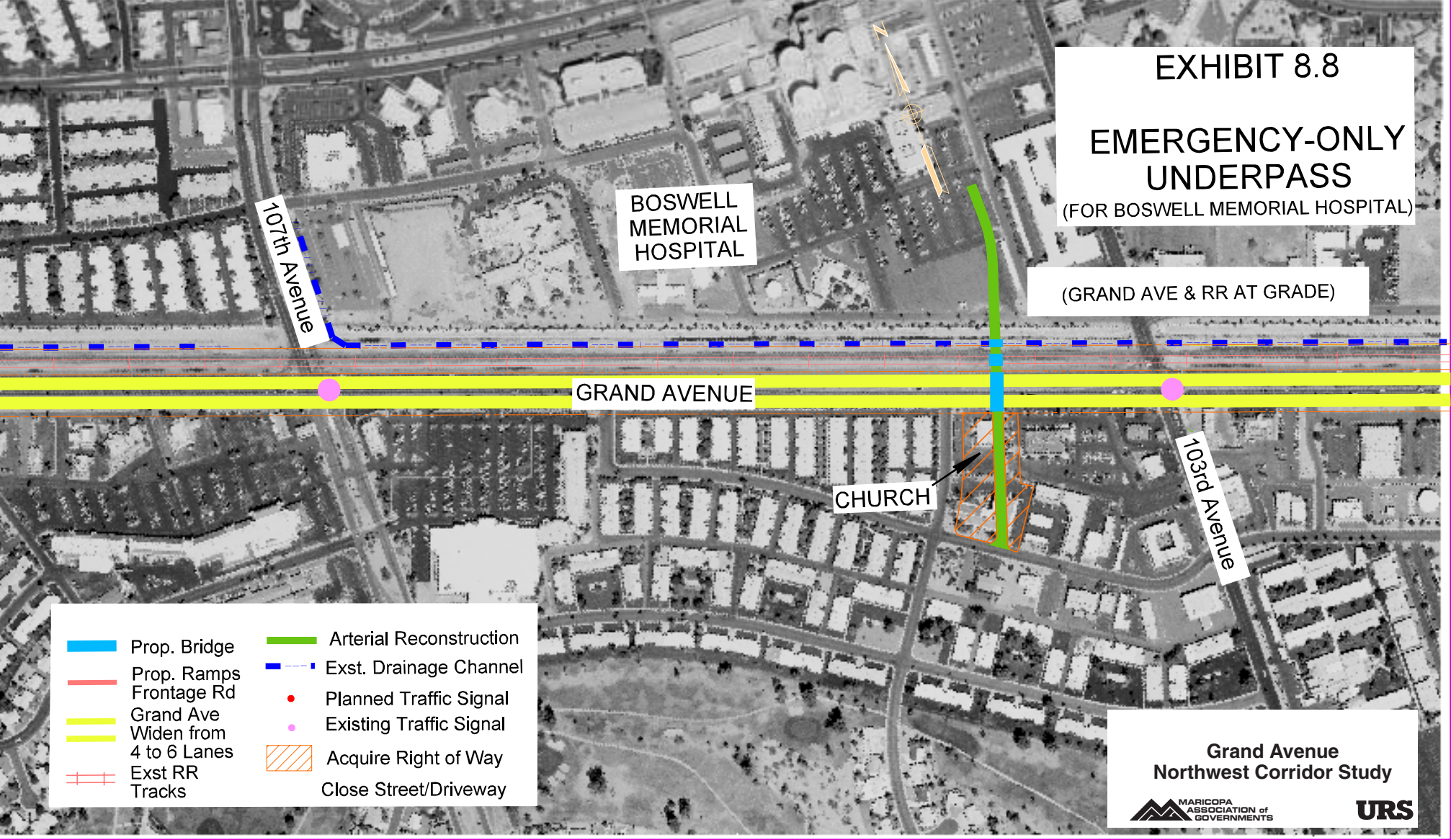


EXHIBIT 8.8
EMERGENCY-ONLY UNDERPASS
(FOR BOSWELL MEMORIAL HOSPITAL)
(GRAND AVE & RR AT GRADE)
BOSWELL MEMORIAL HOSPITAL
107th Avenue
GRAND AVENUE
CHURCH
103rd Avenue
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue
Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS

The **Del E. Webb Memorial Hospital** is located on the northeast side of Grand and the railroad and just north of Meeker Boulevard. An interchange at Meeker and an emergency-only access options were identified and evaluated.

Option F: **Meeker/Reems**: An underpass for Meeker/Reems below Grand Avenue and the BNSF Railroad, both of which would both stay at-grade, could be constructed. The existing cross road skew is minimal at this location so a single point urban interchange would be possible. Approximately 74 feet of new right-of-way would be needed. The interchange would likely require the elimination/relocation of shopping centers on both sides of Reems Road. Refer to Exhibits 8.9 and 8.10. A shoofly for the railroad would be needed to construct the underpass. The drainageway between the railroad and Sun City West would require special design consideration in order to maintain the drainage flow and avoid having the Meeker/Reems underpass so deep that its impact would hamper access into the hospital and its cost would be prohibitive.

The cost of right-of-way and construction of an interchange would be approximately $30 million. It would have major impacts to commercial areas. Other than providing a grade separation with the railroad, the interchange is not needed to accommodate traffic design volumes. Maintaining good access to the hospital during construction would be difficult; however, if the alignment of the new underpass is shifted to the south of the Meeker centerline, it may be possible to maintain some traffic flow on Meeker during construction. An interchange at this location would have large impacts on existing land uses. It would benefit travel on Grand Avenue by the removal of one or more traffic signals; it would enhance motorized and non-motorized travel across Grand, and it would enhance emergency access to the hospital.

Option G: **Emergency-Only Access**: An alternative to the interchange at Reems/Meeker would be an underpass under Grand Avenue and the BNSF Railroad located northwest of Reems Road. The underpass would provide one-way inbound access to the hospital. An northwest-bound and southeast-bound ramp from Grand Avenue would be provided. Refer to Exhibit 8.11. Use of the underpass would only be for emergencies. The grade separation would cost approximately $6 million.

Responses to the questionnaires were in favor of a grade separation to improve access to Del E. Webb Memorial Hospital. All of the alternatives will be expensive, require the removal of commercial property, and will disrupt traffic during construction. If the Hospital becomes a partner to the emergency only access, that option might be feasible. However, the availability of ADOT highway funds for such an access point is questionable.

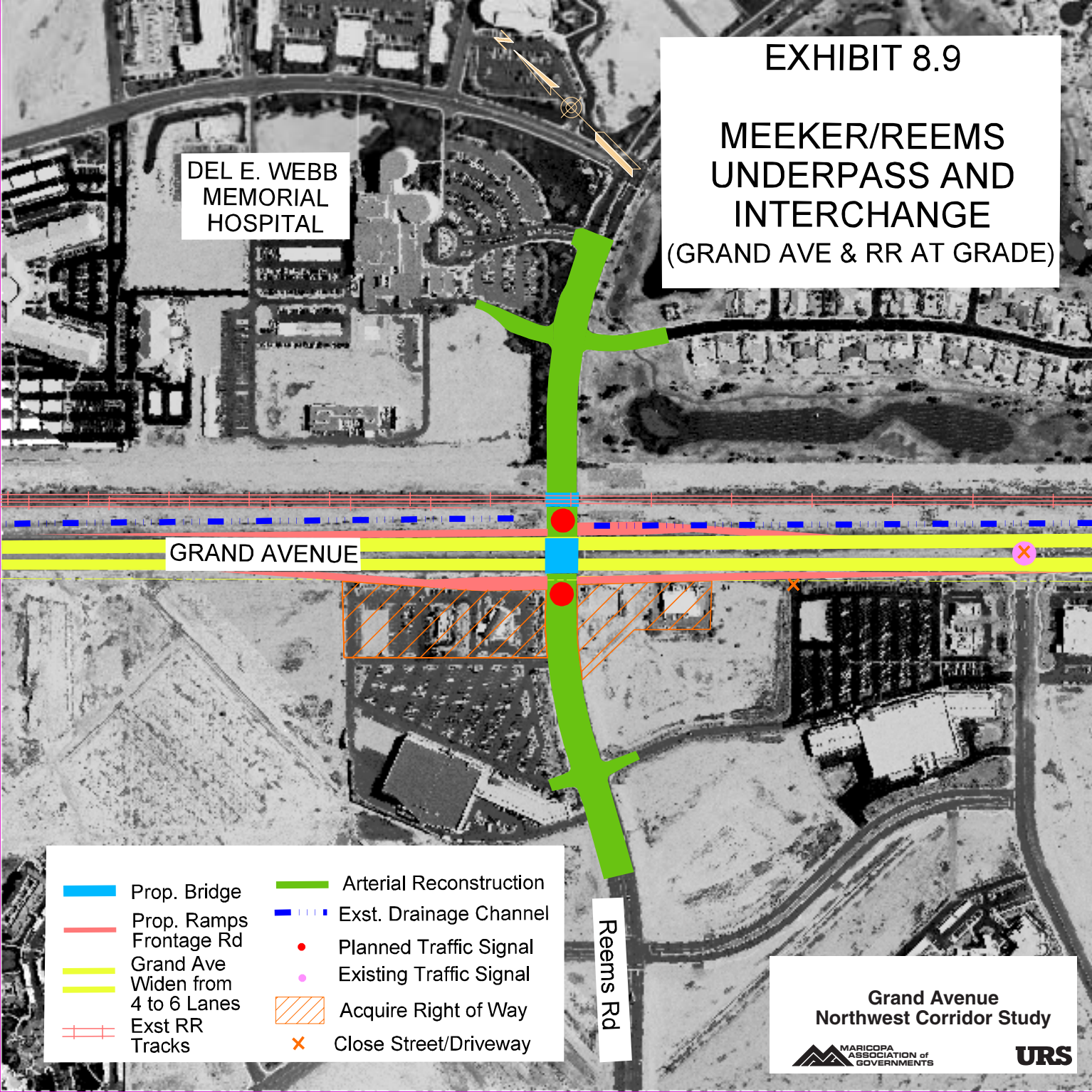
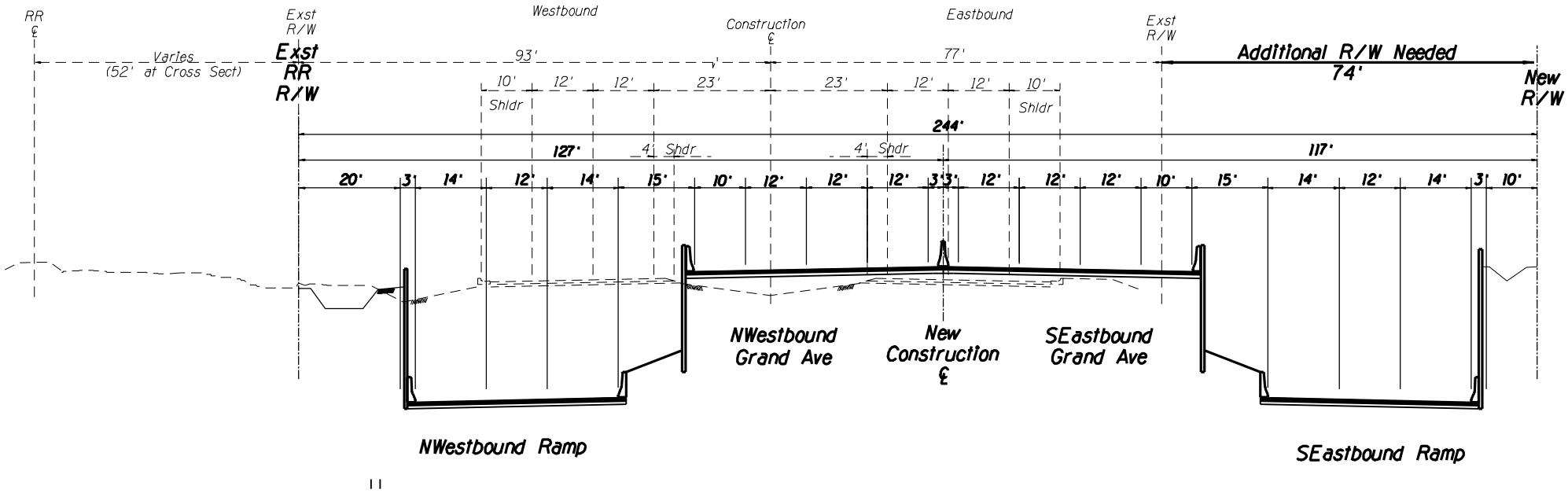
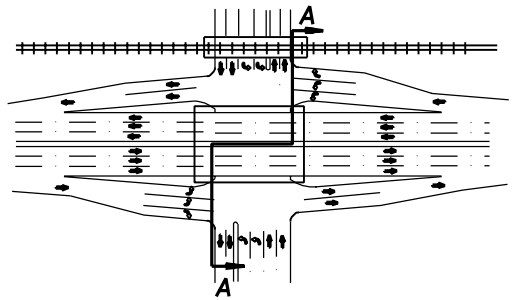


EXHIBIT 8.9
MEEKER/REEMS UNDERPASS AND INTERCHANGE
(GRAND AVE & RR AT GRADE)
DEL E. WEBB MEMORIAL HOSPITAL
GRAND AVENUE
Reems Rd
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS





PROPOSED TIGHT SPUI/DIAMOND
PLAN VIEW

Exhibit 8.10
Meeker/Reems Underpass at Grand Avenue
Cross Section A-A
(looking SE)

Grand Avenue
Northwest Corridor Study

MARICOPA ASSOCIATION of GOVERNMENTS

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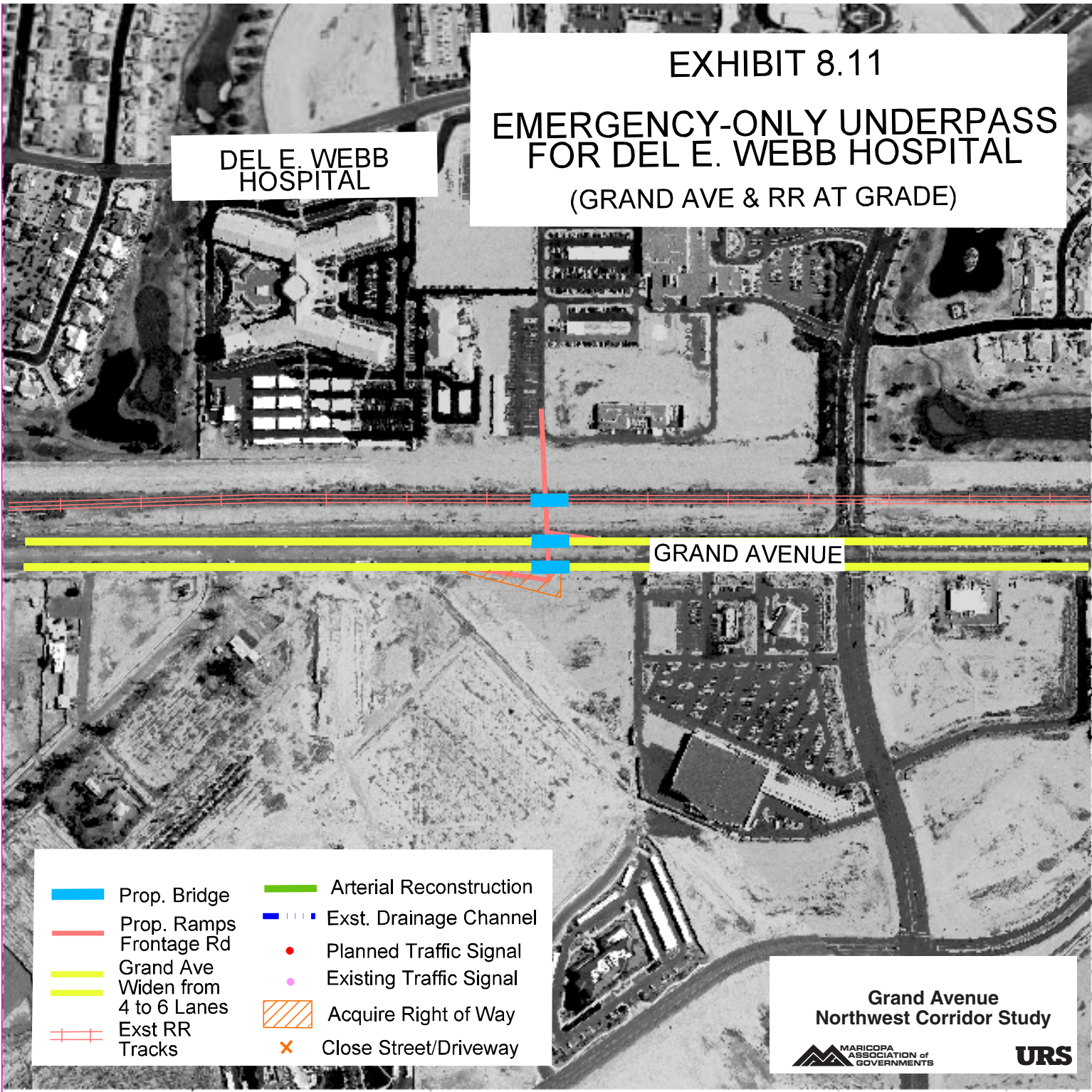
EXHIBIT 8.11
EMERGENCY-ONLY UNDERPASS FOR DEL E. WEBB HOSPITAL
(GRAND AVE & RR AT GRADE)
DEL E. WEBB HOSPITAL
GRAND AVENUE
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
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In December 2001, the project team and MAG met with representatives of Sunhealth Systems, owners of both Del E. Webb and Boswell Hospitals. The access road as shown in Exhibit 8.11 is in conflict with hospital expansion which is now under construction. Sunhealth indicated a willingness to participate in a study to find a suitable location for a grade separation for use by public and private vehicles with passengers in need of emergency care. The study should include representatives from the Surprise Fire Department because they provide emergency service in the area. An emergency-only grade separation and the Meeker/Reems interchange should be included in the study.

8.2.3.2 Grade Separations for Capacity and to Promote Expressway Concept

All the intersections along Grand Avenue were reviewed for the need to provide grade separations. Three of those were dealt with as access to the hospitals and others are considered in the section on continuous routes. The only intersection that requires a grade separation in order to maintain an LOS D in 2025 is Bell Road. Listed below are all existing major intersections. If the grade separation is dealt with more specifically in another category, it is noted by "see Option _____."

The project team has reached a level of conclusion for each location. Several locations are labeled "Eliminate," which means that option does not appear to be feasible. Others are labeled "Low Probability" which means that the degree of impact is severe enough to make the probability of implementation very low. Two locations are labeled "Limited Value" which means that benefits are low compared to impacts. Only one location, RH Johnson/Sunrise, is labeled "Potential." In this area, it appears that Grand Avenue was aligned to provide additional right-of-way to accommodate a future interchange. However, the cross street is lower volume than most other streets so the value of the grade separation is limited. The value is even more limited if this is the only grade separation provided in the Grand Avenue study corridor. As a result, other than Bell Road, no additional locations were listed as "Options."

Grand Avenue/Major Street Intersection
Potential Grade Separations

Major Cross Street	Configuration	Comments	Feasibility
1. RH Johnson/Sunrise	Grand under	Right-of-way available; not high volume	Potential
2. Meeker/Reems	a) M/R under Grand/RR	See Option F	Low
	b) Grand Under	Land use impacts; remove one signal	Higher, but no grade separation with railroad
3. Bell Road	a) Bell under Grand	See Option H	Low because of drainage and cost
	b) Grand Under	See Option H	Low, but most needed

Grand Avenue/Major Street Intersection Potential Grade Separations			
Major Cross Street	**Configuration**	**Comments**	**Feasibility**
4. Dysart Road	Grand under	Land use impacts; drainage; less major street	Eliminate
5. Greenway Road	Greenway under	See Option K	Limited value
6. Railroad Spur	Grand under	See Option L	Limited value
7. 107th Avenue	a) Grand under	Severe land use impacts	Eliminate
	b) 107th under Grand/RR	See Option C	Eliminate
8. 99th Avenue	Grand under	Land use impacts	Low

Option H: **Bell Road**: Bell Road would be an underpass below Grand Avenue and the BNSF Railroad which would both stay at-grade. A diamond interchange would need to be used at this location because of the highly skewed crossroad (45 degrees). Refer to Exhibits 8.12 and 8.13. Traffic signals at the ramp terminals would be located on Bell Road. Approximately 23 feet of new right-of-way would be needed. The interchange would likely require the relocation of part of the shopping center being built on the south side of Bell Road west of Grand Avenue. The traffic signal into the Home Depot shopping center would be removed because of its close proximity to the interchange ramps. Likewise, the planned signal immediately on Grand south of Bell Road would also need to be removed (or not constructed). A shoofly for the railroad would need to be constructed to build the underpass. The grade separation would cost approximately $40 million.

An alternative grade separation would be to depress Grand Avenue under Bell Road. Ramps would connect Grand Avenue with Bell Road and traffic signals at the ramp terminals would be located on Bell Road. The impacts and costs would be similar to the Bell Underpass.

Bell Road could also have an overpass over the railroad and Grand Avenue. Because of the vertical clearance requirements over the railroad, the overpass impacts would extend much further east and west along Bell Road as compared to the underpass. As a result, the overpass was not viewed as acceptable to the community.

Based on the design volumes, Bell Road will need to be grade separated with Grand Avenue to provide an acceptable level of service. Bell Road is a major east-west route through the West Valley and a grade separation would enhance Bell Road as a regional route. An interchange at this location has merit; however, the cost and impacts to existing commercial property would be extensive. Responses from the questionnaires showed strong support for this grade separation. However, the commercial development near the intersection is strongly opposed to the grade separation if traffic signals and access are eliminated.

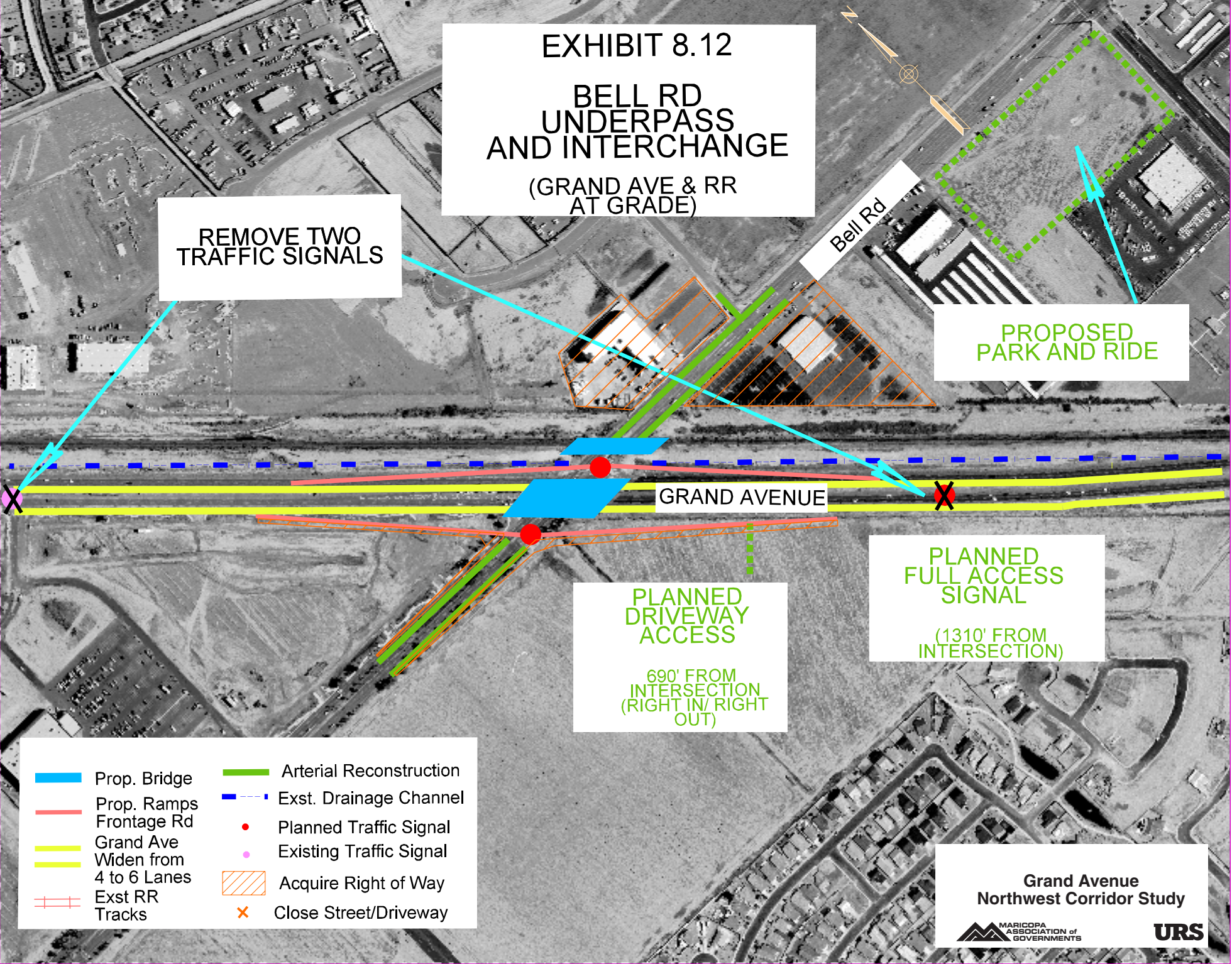
EXHIBIT 8.12
BELL RD UNDERPASS AND INTERCHANGE
(GRAND AVE & RR AT GRADE)
REMOVE TWO TRAFFIC SIGNALS
Bell Rd
PROPOSED PARK AND RIDE
GRAND AVENUE
PLANNED DRIVEWAY ACCESS
690' FROM INTERSECTION (RIGHT IN/ RIGHT OUT)
PLANNED FULL ACCESS SIGNAL
(1310' FROM INTERSECTION)
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
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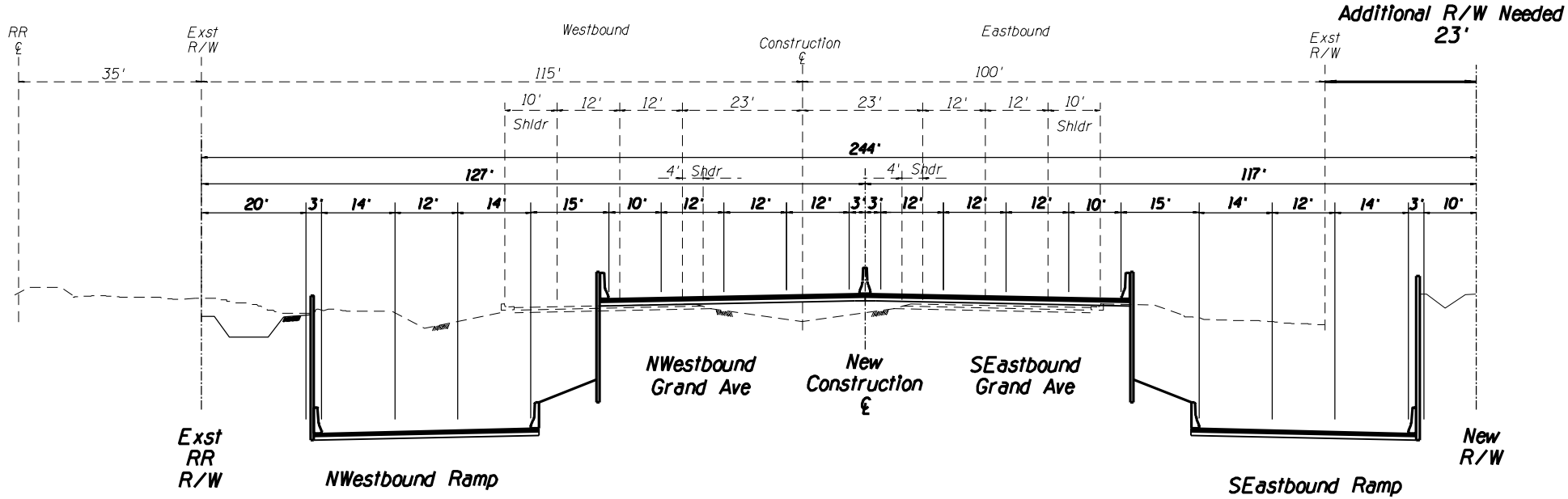
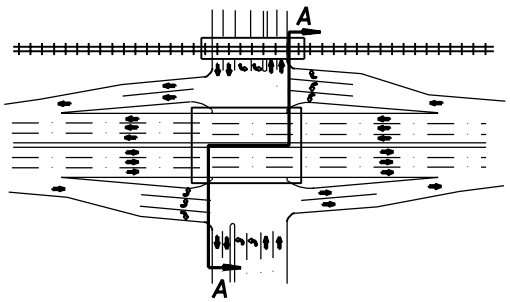




PROPOSED TIGHT DIAMOND
PLAN VIEW

Exhibit 8.13
Bell Road Underpass at Grand Avenue
Cross Section A-A
(looking SE)

Due to the potential for major impacts to commercial properties, a grade separation at Grand Avenue and Bell Road was eliminated from further consideration. Improvements to the intersection will be made through the basic highway improvement program. Needs at the intersection should be monitored over time.

8.2.3.3 Continuous Routes Across the Corridor

Need: ***One of the deficiencies noted by the project team is the lack of continuous north-south and east-west arterials in the study area. Between SR 101L and SR 303L, the only continuous north-south street is 99th Avenue. This configuration leaves an 8-mile gap in the arterial system. Bell Road on the north is the only east-west street between Olive Avenue on the south and SR 303L (under construction). This is a distance of 9 miles. As a result, Grand Avenue must serve as US 60 and serve as the arterial system in a 70-square-mile area. If other routes could be extended, they would help relieve Grand Avenue and provide an opportunity to provide grade separations with Grand Avenue and the railroad. Three options were identified and evaluated***.

Option I: **El Mirage/Thompson Ranch Road**: El Mirage Road is being upgraded to a six-lane arterial north of Bell Road. It will interchange with SR 303L 3 miles north of Bell. South of Bell Road, El Mirage Road is a five-lane arterial. It has recently been connected to Thompson Ranch Road which curves to the east, serves the BNSF automobile yard, and connects to Grand Avenue at a signalized intersection. Thunderbird Road is the south leg of this intersection. It curves sharply to the west just south of the intersection. The route provides some local circulation but does not serve a more community-wide or regional function.

An alternative would be to extend El Mirage/Thompson Ranch Road on a bridge over Grand Avenue and the BNSF Railroad, which would both stay at-grade. Refer to Exhibit 8.14. This new overpass roadway would be extended southward to Olive Avenue or Northern Avenue and would tie to El Mirage Road to the north. A half diamond interchange on the south and a two-way connector road with signals to the north would provide access to Grand Avenue. The proposed crossroad skew is approximately 7 degrees at this location. The existing signal at Thompson Ranch Road and Grand Avenue would remain. The grade separation would cost approximately $21 million. An additional $14 million would be needed to extend the road to Olive for a total project cost of $35 million.

The grade separation has merit in providing an addition north-south through route within the study area. However, new development is occurring south of Grand Avenue in El Mirage. This proposed route would impact the new residential areas. Responses from the questionnaires showed general support for this grade separation. Without the full support of the City of El Mirage, this option is not feasible.

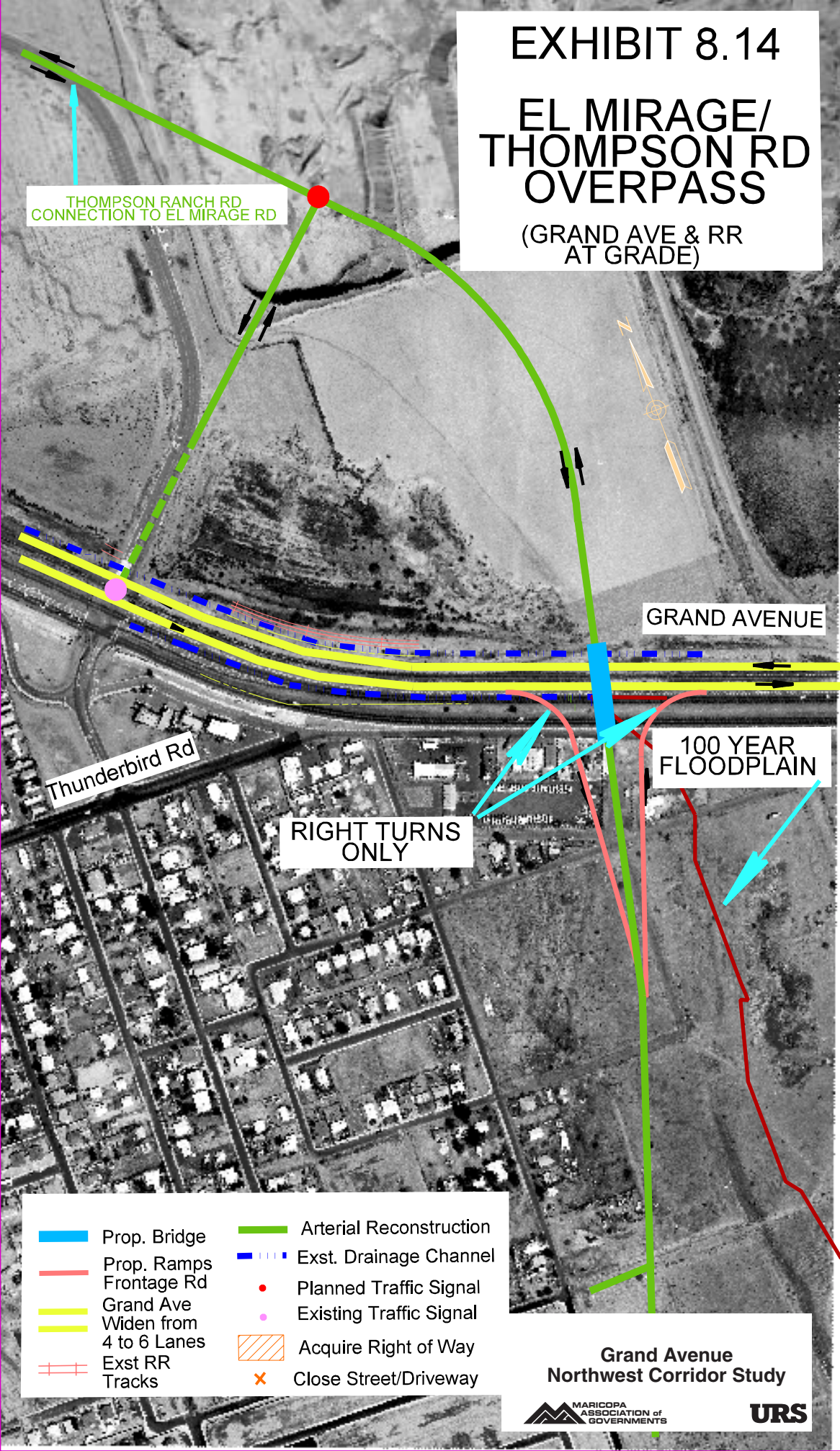


EXHIBIT 8.14
EL MIRAGE/ THOMPSON RD OVERPASS
(GRAND AVE & RR AT GRADE)
THOMPSON RANCH RD CONNECTION TO EL MIRAGE RD
GRAND AVENUE
Thunderbird Rd
RIGHT TURNS ONLY
100 YEAR FLOODPLAIN
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS

Option J: **El Mirage Road**: A second option for El Mirage Road would be to extend it southwestward from the point where it meets Thompson Ranch Road and Greenway Road. It would be extended over the BNSF Railroad and Grand Avenue. Refer to Exhibit 8.15. The road would be realigned to the west around existing residential development between Thunderbird Road and the BNSF Railroad spur. The road would then turn eastward, cross the BNSF spur track at-grade and reconnect with El Mirage Road. There would be no connections with Grand Avenue. The grade separation would cost approximately $20 million. An additional $11 million would be needed to connect the roadway back to the existing El Mirage Road alignment south of Thunderbird Road for a total project cost of $31 million.

The overpass has merit in providing an additional north-south route for the corridor. New development occurring along the proposed alignment reduces the potential of realigning El Mirage Road. Accordingly, the full support of the City of El Mirage will be needed to preserve the option and to implement the grade separation. Other potential alignment alternatives should be explored including extending El Mirage Road on an overpass near the section line.

Option K: **Greenway Road**: A variation of the above option would be to extend Greenway Road as an underpass below Grand Avenue and the BNSF Railroad, which would both stay at-grade. Ramps would be provided using a diamond interchange. Refer to Exhibits 8.16 and 8.17. A single point urban interchange cannot be utilized here because of the highly skewed crossroad (45 degrees). Greenway Road would be improved to El Mirage Road, north of Grand Avenue and to Litchfield Road south of Grand Avenue. The narrow existing right-of-way requires Grand Avenue to be realigned slightly to the south to make room for the northwest bound on/off-ramps abutting the railroad right-of-way. A shoofly for the railroad would need to be constructed to build the underpass.

Approximately 29 feet of new right-of-way is needed. The interchange would likely require the relocation of a building at the Floral Lakes Memorial Gardens Cemetery and the relocation of three or four businesses southwest of Grand Avenue and along Greenway Road. There are schools along Greenway Road west of Grand. The two-way frontage road would also be realigned. The underpass would disconnect residential neighborhood access to Greenway Road through the depressed sections (approximately 1,000 feet on either side of Grand Avenue). The grade separation would cost approximately $30 million to construct.

Responses from the questionnaires showed it was the least supported grade separation.

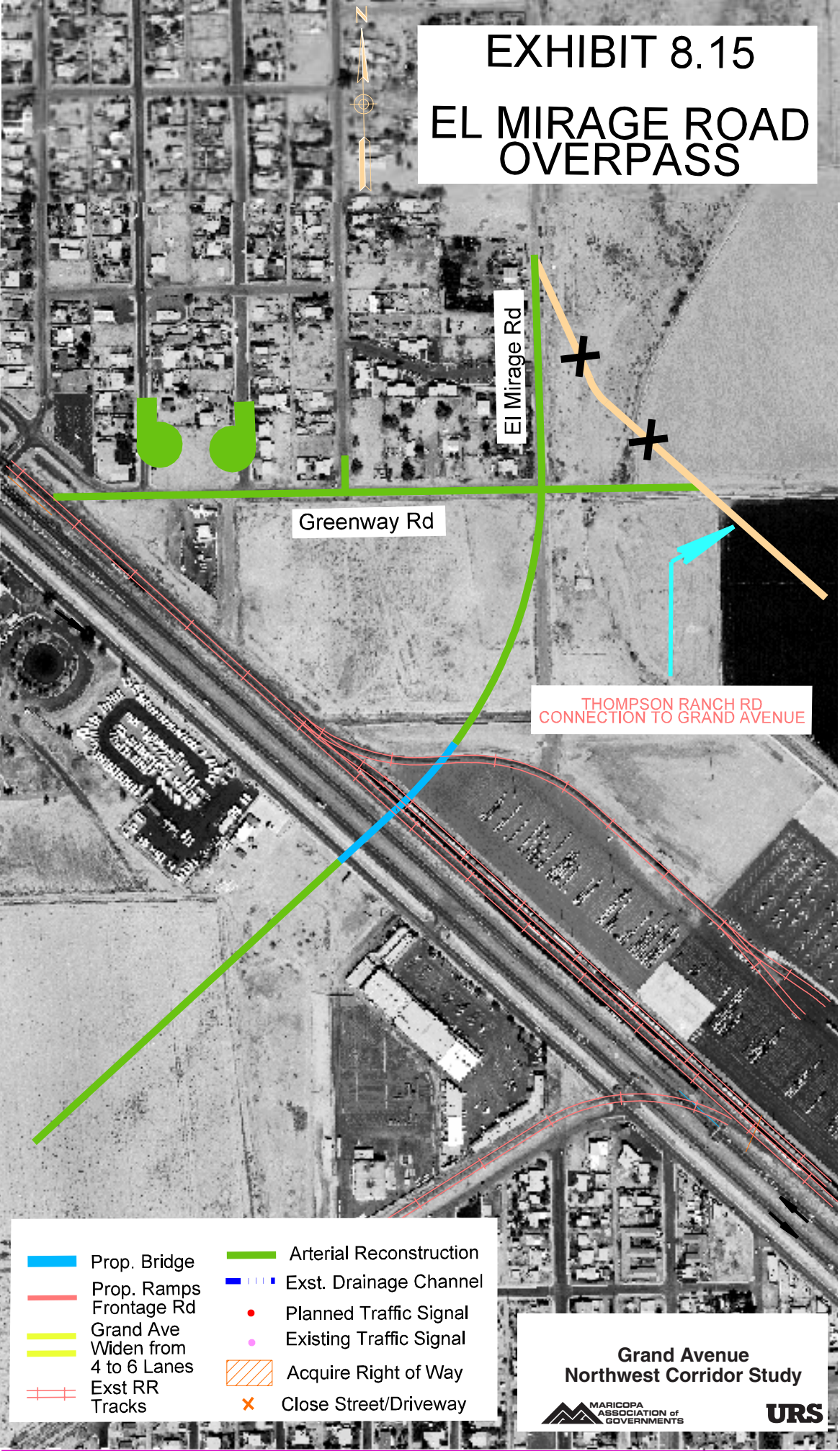


EXHIBIT 8.15
EL MIRAGE ROAD OVERPASS
N
El Mirage Rd
Greenway Rd
THOMPSON RANCH RD
CONNECTION TO GRAND AVENUE
Prop. Bridge
Prop. Ramps
Frontage Rd
Grand Ave
Widen from
4 to 6 Lanes
Exst RR
Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue
Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS

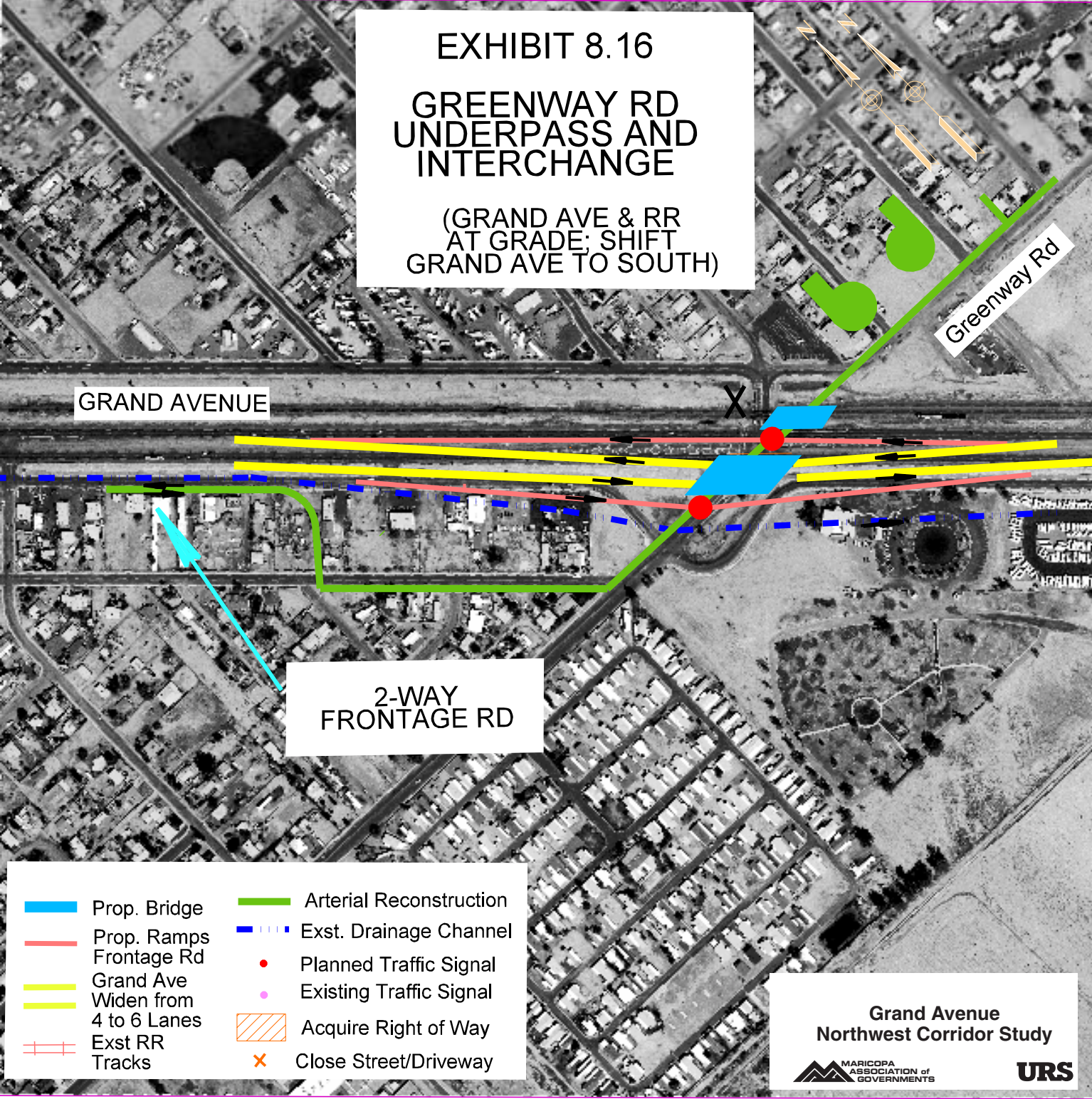
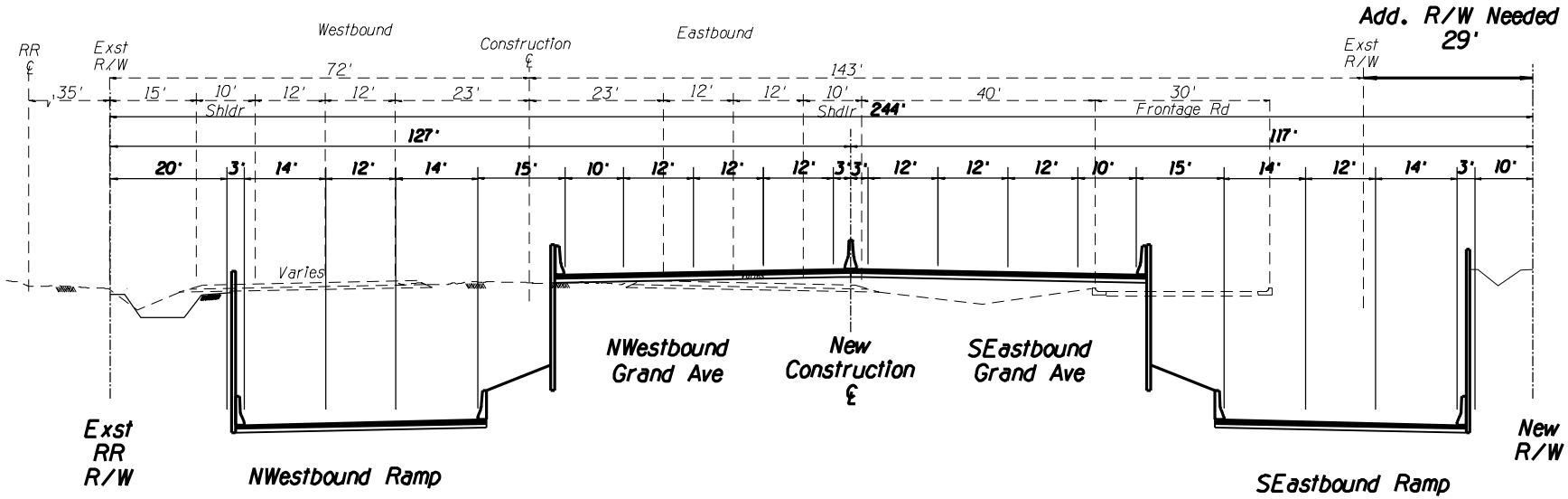
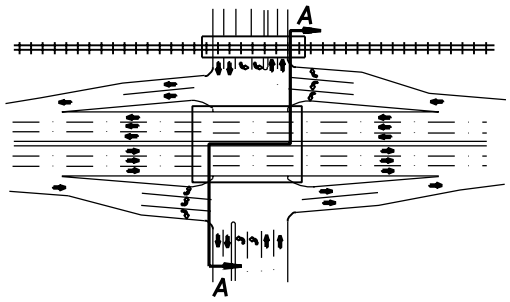


EXHIBIT 8.16
GREENWAY RD UNDERPASS AND INTERCHANGE
(GRAND AVE & RR AT GRADE; SHIFT GRAND AVE TO SOUTH)
Greenway Rd
GRAND AVENUE
X
2-WAY FRONTAGE RD
Prop. Bridge
Prop. Ramps Frontage Rd
Grand Ave Widen from 4 to 6 Lanes
Exst RR Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue Northwest Corridor Study
MARICOPA ASSOCIATION of GOVERNMENTS
URS





PROPOSED TIGHT DIAMOND
PLAN VIEW

Exhibit 8.17
Greenway Underpass at Grand Avenue
Cross Section A-A
(looking SE)

Grand Avenue
Northwest Corridor Study

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8.2.3.4 Grand Avenue Underpass at BNSF Railroad Spur Track

Need: The only place that Grand Avenue crosses a railroad track within the study area is near the El Mirage section line where the Ennis Spur heads southwest from the BNSF mainline. This spur is used approximately once per day. Consideration was given to grade separating Grand and this spur in order to improve safety and to eliminate traffic delays due to trains.

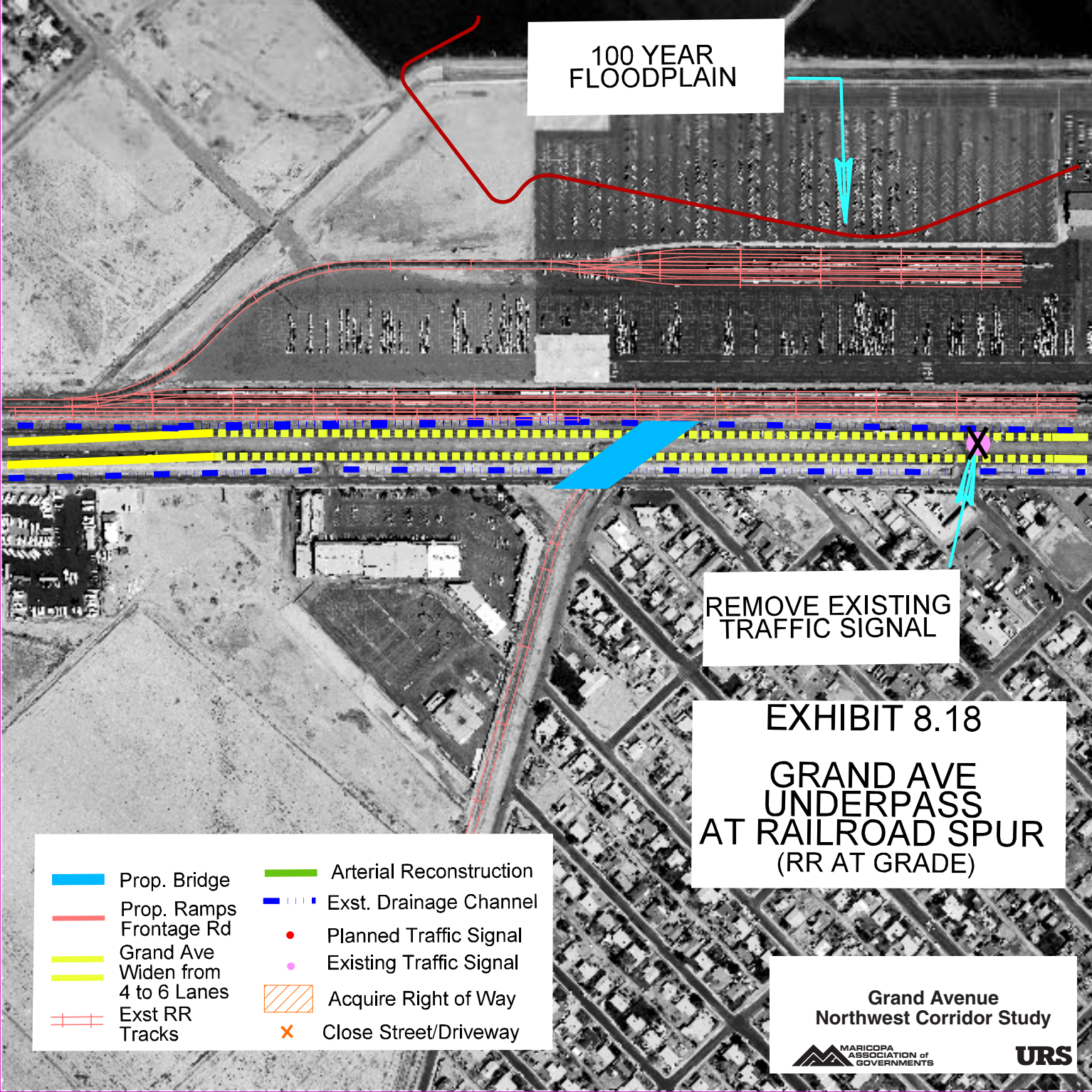
Option L: Grand Avenue would become an underpass and pass below the BNSF Railroad Spur Track. Refer to Exhibit 8.18. The traffic signal at Primrose Street would be removed because the intersection falls within the depressed section of Grand Avenue. The BNSF Railroad Spur Track could be raised a few feet to minimize the depth and length of the underpass. The underpass would cost approximately $17 million.

If the majority of the traffic signals remain, Grand Avenue would not be upgraded to a more free-flow facility. As a result, this grade separation is not essential. Trains infrequently disrupt traffic on Grand Avenue. Even if more BNSF Railroad customers locate along the spur line, delays due to the train would create an insignificant amount of delay compared to the delay created by the remaining traffic signals. The existing at-grade crossing is protected by gates and flashers. Removing the signal at Primrose Street would make travel in and out of the City of El Mirage more difficult. Responses from the questionnaires showed general support for this grade separation. Because of the high cost and limited benefits, a grade separation with the railroad spur is not cost-effective.

8.2.4 Access Management on Grand Avenue

Four elements were considered in access management: eliminate traffic signals, eliminate median breaks for left turns, minimize additional property access and pavement markings. Each of these elements has the potential of improving traffic safety, reducing traffic delays on Grand Avenue, and minimizing side friction with traffic from driveways and local streets.

Grand Avenue has a higher degree of access control than almost all arterials in the metropolitan area due to the railroad located on the northeast side of the roadway. Street crossings of the railroad are limited. In addition, the Sun City developments have generally limited property access to Grand and limited local street connections to Grand. As the new development occurs in the City of Surprise from Dysart Road to the northwest, numerous commercial properties have been built with driveway access to Grand and new traffic signals have been installed.


100 YEAR
FLOODPLAIN
REMOVE EXISTING
TRAFFIC SIGNAL
EXHIBIT 8.18
GRAND AVE
UNDERPASS
AT RAILROAD SPUR
(RR AT GRADE)
Prop. Bridge
Prop. Ramps
Frontage Rd
Grand Ave
Widen from
4 to 6 Lanes
Exst RR
Tracks
Arterial Reconstruction
Exst. Drainage Channel
Planned Traffic Signal
Existing Traffic Signal
Acquire Right of Way
Close Street/Driveway
Grand Avenue
Northwest Corridor Study
MARICOPA
ASSOCIATION of
GOVERNMENTS
URS

8.2.4.1 Remove Traffic Signals

Traffic signals on Grand Avenue would be removed if grade separations described above in several options are implemented. As a result, this action is not considered to be an independent option. The potential signal removals are as follows:

- Option D; 103rd Avenue for access to Boswell Hospital
- Option C: 107th Avenue for access to Boswell Hospital
- Option K: Greenway Road for interchange
- Option H: Planned signal for shopping center south of Bell, Bell Road signal, and Town Center Drive for Bell Road interchange and perhaps Litchfield Road
- Option F: Parkview Place and Meeker/Reems for access to Del E. Webb Hospital
- Option L: Primrose Lane for railroad spur underpass

Consideration was given to removal of the 113th Avenue signal because of its close proximity to the 111th Avenue signal. This close signal spacing substantially hampers the ability to provide good signal progression. Much of Youngtown's commercial businesses are located at this signal so that its removal could have major economic impacts for Youngtown.

Need: Reduce the number of traffic signals on Grand with 18 existing signals in 11 miles. The signal density along Grand is too great to meet the enhanced arterial/limited expressway expected levels of traffic services. The diagonal nature of Grand helps create very uneven signal spacing which greatly complicates good signal progression.

Option M: To achieve good travel speeds through this section of Grand Avenue, the removal of the following signals should be considered whether or not grade separations are constructed:

1. Parkview Place
2. Proposed signal at Mountain View extended
3. Litchfield Road
4. Town Center Drive
5. Planned signal south of Bell
6. Primrose Lane
7. 113th Avenue

8.2.4.2 Eliminate Median Breaks for Left Turns

Need: Left turns across fast moving traffic on Grand Avenue is an inherent safety hazard. However, left-turn access is needed to provide local traffic circulation and access to businesses and other properties along Grand Avenue.

Option N: Left turn median breaks would be eliminated at the following locations:

Beardsley Road

Sunny Lane

Shopping Center, south of Greenway Road

108th Avenue

106th Avenue

105th Avenue

101st Avenue

Median break, east of 99th Avenue

Responses from the questionnaires were mixed for eliminating median breaks along Grand. The elimination of median breaks would have little impact on traffic congestion within the corridor. However, it will promote traffic safety. This issue should be examined further when specific plans are developed for widening Grand Avenue.

8.2.4.3 Policy to Limit New Access to Grand Avenue

Need: Responses from the questionnaires were mixed for limiting new access to Grand Avenue and removal of existing access. If new access to Grand Avenue is not restricted, demand for new traffic signals will increase. With each new signal, travel on Grand Avenue will become more congested and travel speeds will be reduced.

Option O: New access should be restricted to preserve Grand Avenue as a major regional route. Access limitations would be developed in cooperation with the local jurisdictions and enforced through the access permitting process.

8.2.4.4 Pavement Markings and Lane Designations

Local agencies and the public identified safety and traffic operational concerns. It is beyond the scope of this project to conduct a detailed study of pavement markings, lane designations and signage. It does appear that such a study is warranted and should be conducted as a follow-up to this corridor study.

8.3 OPERATIONAL AND AESTHETIC IMPROVEMENTS

Need: The public and local agencies were in general support of improving the aesthetics of the corridor, particularly by providing more landscaping within the corridor. Throughout the majority of the corridor, there is additional right-of-way and wide medians where landscaping could be provided. Generally, ADOT will provide landscaping with its projects to a modest degree. Local jurisdictions are usually responsible for the maintenance.

Option A: Landscaping would be provided the length of the corridor, both on the outside of the roadway and within any median areas. Street lights would be provided at intersections and along areas with sidewalks.

Need: In addition to the infrastructure options discussed above, local agencies and the public identified several safety and traffic operational problems that need to be addressed within the corridor. The following studies would address these issues.

Option B: Traffic signage within the corridor would be evaluated. Special emphasis would be placed on signs that meet the needs of the elderly population. Suggested improvements for traffic signs include providing larger letters and clear and concise directions on signs. City and County signage should be included in the evaluation.

Option C: A traffic barrier (guardrail) would be provided between the drainage channel and Grand Avenue. The space between the roadway and the channel is very limited, and it may not be possible to install guardrail without reconstruction of the channel.

Need: There seems to be unanimous support from both local agencies and the public for providing signal coordination along Grand Avenue. The conduit and fiber installation would cost between $2-$2.5 million. Implementing ITS applications along Grand Avenue is consistent with regional ITS plans. The traveling public would receive a significant benefit in reduced congestion and delay if signals are coordinated along Grand Avenue.

Option D: The ITS "Smart Corridor" would be extended along Grand Avenue from Bell Road to SR 303L. Elements of this program include a communications link (fiber optic or wireless), CCTV cameras, variable message signs and signal coordination. The corridor will need to be linked to a traffic management center (TMC). Candidate TMC are in Peoria, Glendale, Phoenix, MCDOT, or ADOT. Selection of the TMC should be made as part of the Smart Corridor design process and will depend upon intergovernmental agreements. Additional ITS applications consistent with the MAG ITS Strategic Plan would be implemented.

Need: The following signal changes were identified to accommodate 2010 and 2025 design volumes.

- Include a signal overlap phase for NB and SB right-turn lane at Thunderbird Road and Thompson Ranch Road
- Include NB/SB protected left-turn phase (implementation is currently under evaluation by ADOT) on Meeker Boulevard and Reems Road
- Include a signal overlap phase for EB right-turn lane on Bell Road
- Include NB/SB protected left-turn phase on RH Johnson Boulevard

Option E: To accommodate the above signal improvements throughout the corridor, the signal equipment would be evaluated at all intersections with exclusive left- and right-turn lanes. The controller, loops and signal heads would be capable of providing protected left-turn phases and right-turn overlap phases. Signal preemption equipment for emergency vehicles would also be provided at all signalized intersections. Upgraded signal equipment would allow safer and more efficient traffic operations at the signals.

Need: In addition to the infrastructure improvement discussed above, local agencies and the public identified several safety problems that need to be addressed within the corridor. The following studies are recommended to address these issues.

Option F: Safety device operations such as gates would be evaluated for installation at all the railroad crossings.

Option G: Signal timing allowances for pedestrian crossings would be evaluated at all intersections.

8.4 TRANSIT AND OTHER MODES

Needs were identified in Chapter 7. Presented below are action options which address those needs. These options are formulated for agency and public review and comment prior to development of recommendations to be included in the final report. Funding sources to implement the actions have not been identified. Those actions that become part of the final recommendations must be implemented through a combination of programs of the local jurisdictions, regional providers, and private developments.

8.4.1 Transit

The optional actions listed below are intended to meet transit needs in the Grand Avenue Northwest Corridor, as identified in Chapter 7.

Commuter rail operating on the BNSF railroad trackage is a possibility; however, there is only one track which is heavily used by freight traffic. Some preliminary discussions have been held regarding the potential to construct a new freight rail yard northwest of the study area and thereby reduce freight train activity in the corridor. The remaining rail freight traffic would be delivered at night thus making the trackage available for commuter rail during the day. This operation could increase the net usage of the track and the amount of nighttime maneuvers. There may be adverse impacts created. These issues are being addressed in the high-capacity transit study being undertaken by MAG.

Light rail transit (LRT) in the corridor is also a possibility. There may be a possibility of constructing the LRT on BNSF right-of-way. The presence of LRT and freight railroad would exacerbate the auto-rail and pedestrian-rail conflicts that current exist in the corridor. Glendale is currently studying extension of the LRT from Phoenix to Glendale. Once this location is determined, further extension to the north and/or west would be the logical subject of future study efforts.

Since transit improvements should be made as part of large system improvements which are beyond the scope of this corridor study, no specific cost estimates have been made for the various options. In reviewing these options, it may be helpful to consider typical unit costs obtained from RPTA:

Operating Cost per	Revenue-mile	
	Fixed Route	$4.14
	Dial-A-Ride	$2.56
	All Services	$3.39
Operating Cost per	Revenue-Hour	
	Fixed Route	$58.90
	Dial-A-Ride	$37.18
	All Services	$52.00
Capital Cost	Standard Bus	$310,000
	Bus Less than 30 Feet	$60,000 (Sun City Transit Area)
	Dial-A-Ride Van	$45,000

Federal government often pays 80% of capital costs.

Need: The regional bus system needs to be extended through the study corridor into Surprise, El Mirage, Sun City and Sun City West.

Option A1: Local bus service on Grand Avenue would be extended from downtown Peoria to Surprise and Sun City West, terminating in the vicinity of Del E. Webb Memorial Hospital. This route would bring regional service to Sun City, El Mirage, Surprise and Sun City West. An

extension of the existing Yellow Line would provide through service to the State Capitol, downtown Phoenix and downtown Tempe. This option is appropriate to be implemented in the short term, as soon as a funding source can be secured.

Option A2: Other existing regional routes would be extended, and new routes would be developed through the study corridor. Routes that have been recommended in previous studies include: extension of the Bell Road route (170) west to Surprise, extension of the Thunderbird route (138) west to Boswell Memorial Hospital, and a new north-south route on Dysart Road. This option is appropriate to be implemented in the short term, as soon as a funding source can be secured and as demand warrants.

Option A3: Appropriate locations for on-street bus bays (also known as pullouts) would be identified and constructed as funding permits. A sufficient number of bays would be provided so that vehicles could pass stopped buses, but transit vehicles would not be unduly delayed by waiting for gaps to re-entry the traffic stream. The best locations for bus bays are generally at the far side of signalized intersections, where the signal creates periodic gaps. Timepoints, where buses running early must wait until their scheduled time, are often desirable locations for bus bays. Bus bays would not be located where entering or exiting ramp traffic may interfere with buses pulling out or re-entering traffic lanes.

Need: Bus stops in the study corridor need to be designed to maximize passenger safety and comfort.

Option B1: As bus service is extended into the corridor on Grand Avenue and other roads, bus stops would be placed approximately one-fourth mile apart, and at all major intersections containing commercial nodes. As many stops as possible would be equipped with shaded benches, landscaping, trash cans, resting bars and posted timetables. Stops would be set well back from the traveled roadway surface, and buffers provided to the extent feasible. All bus stops would be accessible to mobility-challenged riders and located close to crosswalks and entrances to walled-off neighborhoods. At major transfer points such as Grand Avenue/Bell Road, the use of both near-side and far-side stops to facilitate transfers in all directions would be considered. If grade-separated interchanges are to be constructed, they would be designed so as to avoid excessive walk distances for bus riders, especially those who need to transfer. In general, the guidelines in the Valley Metro Bus Stop Handbook would be followed.

Need: Paratransit (including Dial-a-Ride) services throughout Northwest Corridor communities require restructuring to better meet travel needs, especially those of older residents.

Option C1: The short-term feasibility of better coordinating services offered by the Peoria, El Mirage, Surprise and Sun Cities Dial-a-Ride systems would be studied, with a view to implementing a combined system, similar to the existing East Valley Dial-a-Ride. Participants would include MAG, RPTA, MCDOT, the operators of the non-profit Sun Cities Area Transit,

and the cities of El Mirage, Peoria and Surprise. The most important elements for the short term would be a common fare structure and the ability to cross jurisdictional boundaries, at least to a limited extent, without changing vehicles. If bus service is extended into the corridor, efficient transfers between regional bus routes and dial-a-ride should be available. The ultimate goal should be a completely seamless West Valley Dial-a-Ride system.

Option C2: In the short- to mid-term, the feasibility and cost-effectiveness of innovative approaches to serving seniors and persons with disabilities would be studied. Such approaches could supplement or even replace Dial-a-Ride in some areas. Examples include flex routing of buses, mileage reimbursement, taxi vouchers, senior van pools and subscription bus services. Participants should include those listed in the preceding recommendation, as well as the Maricopa County Human Services Department, the American Red Cross, the Sun City Homeowners Association and the Sun City West Property Owners & Residents Association.

Need: Park-and-ride capacity is needed near SR 101L.

Option D1: In the short- to mid-term, a regional park-and-ride lot would be developed to serve the eastern portion of the study corridor (vicinity of Grand Avenue/SR 101L) and adjacent areas. The MAG Park-and-Ride plan specifies a site near the intersection of SR 101L and Glendale Avenue in Glendale. A facility at this location would serve future express bus routes from the Grand Avenue Northwest Corridor and the Arrowhead Towne Center area, as well as carpools.

Need: Bus routes and Dial-a-Ride services will need to meet regional service standards.

Option E1: In the mid-term (5 to 10 year) period, all transit service levels in the Grand Avenue Northwest Corridor would be upgraded to regional standards. These standards, as presented in Exhibit 1 of the *Valley Metro Short Range Transit Report* for 2001-2005, include bus service frequencies of 15 minutes or less during peak periods, 30 minutes off-peak and Saturday, and 60 minutes on Sunday. Local bus routes are to operate 20 hours per day on weekdays, 19 hours on Saturday and 18 hours on Sunday. There are also standards for route layout and spacing, transfers, passenger stops and bus stop treatments.

Need: Surprise, Sun City, Sun City West and Youngtown will require improved alternatives for local circulation.

Option F1: Existing travel patterns and desires would be evaluated in order to identify circulator bus routes that would connect neighborhoods to key local destinations, activity centers and regional routes. A demonstration project in an area appears particularly promising. To give the service a reasonable chance of success, it should operate frequently (at least twice an hour), throughout the day, and bi-directionally (if the route is an extensive loop). It should also be well marketed locally. Bus stops should be equipped with passenger amenities at key locations. Wherever appropriate, cooperation should be secured from commercial property owners to allow buses to pull into retail centers and medical and social service facilities. A successful

demonstration project could lead to implementation of additional routes elsewhere in the corridor. All vehicle specifications must be written with the needs of senior and mobility-challenged residents in mind.

Need: Park-and-ride capacity will be needed in the western portion of the corridor.

Option G1: In the mid- to long-term, a regional park-and-ride lot may be needed to serve the western portion of the study corridor (vicinity of Grand Avenue/Litchfield Road) and adjacent areas. The MAG Park-and-Ride plan specified a site near the intersection of Bell and Dysart Roads in Surprise. A facility at this location could serve future express buses from the Surprise/El Mirage area, as well as carpools.

Need: Express and/or high-capacity transit may be needed in the future as an integral part of the regional system.

Option H1: In the short- to mid-term, the potential modal options for long-term extension of the regional high-capacity transit system through the Grand Avenue Northwest Corridor would be studied. Chapter 7 identified several such options: Bus Rapid Transit (BRT), Light Rail Transit (LRT) and Commuter Rail. Each of these modes would face significant challenges to implementation in this corridor. Commuter rail would require an agreement with the BNSF Railroad to share a heavily used, predominantly single-track freight line with numerous grade crossings. MAG's High Capacity Transit Study will consider modal options for the corridor.

As noted in Chapter 7, effective Bus Rapid Transit would require signal pre-emption and exclusive bus lanes or high-occupancy-vehicle (HOV) lanes on Grand Avenue, to ensure that buses would not be slowed by single-occupant-vehicle traffic. LRT has even more restrictive requirements, in that the tracks would require exclusive use of two-lane equivalents. If the tracks were placed in the median, no left turns would be permitted at unprotected locations for safety reasons. However, the roadway cross-section is limited to six lanes. Dedicating two lanes to bus or light rail transit would reduce the effective capacity of Grand Avenue by approximately one-third.

One way to preserve some of this capacity would be to operate BRT in lanes shared with other HOVs (vehicles with more than one occupant) rather than in exclusive lanes. However, replacing general traffic lanes with HOV lanes on Grand Avenue would raise the following problems and concerns:

- Buses and carpools do not mix as well on arterial streets as on freeways, especially if local buses that stop frequently are included in the traffic mix.
- The travel time benefits to carpoolers may be negligible, especially if the curb lanes are reserved for HOVs, owing to the continued availability of these lanes to vehicles making right turns (to and from the mainline) at driveways and intersections. Ramp

merge/diverge movements at grade-separated interchanges could also reduce the travel time advantage of curbside HOV lanes. Median HOV lanes present their own operational problems due to left-turning vehicles weaving across the lanes.

- Police enforcement of HOV restrictions would be complicated by the need to allow general traffic to use the lanes for right turns. This issue currently affects Central and First Avenues between Roosevelt and Van Buren, the only arterial streets in the Phoenix area that have restricted diamond lanes.
- HOVs may be blocked by right-turning vehicles at intersections. Where right-turn lanes exist, safety hazards may result from vehicles weaving across the HOV lane to reach the turn lane.
- Local buses in a curbside HOV lane will hinder non-stop express bus operations. Drivers may not expect to see BRT buses pull out of the HOV lane to pass local buses.
- If HOV lanes are underutilized compared to the general traffic lanes, they not only are perceived as wasteful and inefficient, but also create safety issues. Drivers turning right onto Grand Avenue may perceive the curb lane as mostly empty and fail to watch closely enough for approaching vehicles. This concern is especially pertinent to buses, which require substantial distances for emergency stops when traveling at high speeds.
- Another safety issue arises from drivers making right turns onto the mainline, who may turn directly into the inside lanes instead of merging to the left from the curb HOV lane. These merging maneuvers would impede HOV operations and complicate enforcement.

In sum, Grand Avenue from SR 101L to SR 303L does not appear to be a good corridor for HOV lanes. The conclusion that Grand Avenue is not a suitable corridor for HOV lanes is consistent with MAG's HOV System Plan.

8.4.2 Pedestrians

Within this section needs and options for improving pedestrian facilities in the Grand Avenue Northwest Corridor are identified and discussed. The options are derived from an analysis of the needs described in Chapter 7. They also incorporate the recommendations of the MAG Elderly Mobility Working Group.

The following stated objectives were derived from the agency/community forums and the public meeting to mitigate specific impediments or deficiencies. Objectives of the corridor study that specifically pertain to pedestrian travel include:

- Improve aesthetics of the corridor
- Improve crossings of Grand Avenue and the railroad
- Improve traffic operations at intersections

- Improve safety within the corridor
- Enhance elderly mobility
- Enhance alternative mode travel within the corridor

Need: ***Grand Avenue for the length of the corridor does not have curbs or sidewalks, except for short stretches serving recently developed retail centers on the south side of Grand northwest of Bell Road.***

Option A1: A shared use path would be established on the southwest side, linking the communities along Grand Avenue. The path would be wide enough for shared bicycle and pedestrian travel, or approximately 10 feet. It would be landscaped with shade trees, which would improve the aesthetics of the corridor. This route could become part of a loop system to help connect neighborhoods and adjacent communities by modes other than the automobile.

Option A2: On intersecting streets, a wider standard walkway for the corridor — 6 feet on collectors and 8 feet on arterials — would be established. The walkway would be detached from the curb by at least 6 feet to establish a buffer from traffic which would help pedestrians to feel safer using the walkways.

Need: ***Most railroad crossings have not been improved for pedestrians. The BNSF Railroad parallels Grand Avenue for the length of the corridor. All intersecting streets cross these tracks, and all the crossings are protected with crossing arms. However, the condition of the walkway surfaces at these crossings varies.***

Option B1: Every railroad crossing would be developed to a minimum standard, using paved trackway and 8-foot walkways. ADA accessibility would be achieved for at least one side of every crossing, and designated as such with appropriate signage. Pedestrian crossing arms would be added in conjunction with vehicle crossing arms. Shaded queuing space would be provided at intersections.

Need: ***Community walls block pedestrian movements. Much of the corridor is lined with masonry privacy walls, especially where residences back up to the roadway. This long continuous line of wall can prevent pedestrians from accessing a potential pedestrian corridor.***

Option C1: The potential for adding gated connections through these walls between the new shared use path and adjoining neighborhoods would be analyzed. The analysis would determine whether such connections would be acceptable to property owners in these neighborhoods.

Need: ***Channelized right-turn lanes hamper pedestrian movements. Lane configurations on Grand Avenue and intersecting streets, counting dedicated and channelized right turns as well as left turns, can create conflicts between turning cars and crossing***

pedestrians. A channelized right turn lane can confuse the pedestrian as to when crossing is safe.

Option D1: Existing free flow right turns would be eliminated and the creation of new channelized turn movements would be discouraged. Use of double left turns would be discouraged in favor of the creation of longer left-turn pockets.

Need: Access to planned non-motorized travel routes is not currently provided. The West Valley Recreation and Multimodal Transportation Corridor intersects Grand Avenue along this section. The corridor is planned as an interconnecting trail system, linking several jurisdictions along the Agua Fria and New rivers. There is currently no direct connection between the Grand Avenue Corridor and this system, some of which is located on existing flood control bank access way.

Option E1: ADA-accessible connection points would be provided on all four corners of the Agua Fria River bridge. The pedestrian connections would be within one-fourth mile of the bridge to access neighborhoods. Trailhead opportunities would be developed and designated on either side of the bridge. The connection to the non-motorized transportation corridor would be signed.

Need: The long distances between many destinations are difficult for pedestrians. The distances between destinations are well beyond the 5- to 10-minute walk (800 to 1,400 feet) commonly associated with pedestrian areas. Commercial destinations, while common on many intersecting streets, are located relatively far from residential areas. Some commercial areas are not directly connected via a walkway from major adjoining streets to their front doors. The pedestrian often is forced to cross large areas of parking to reach business establishments.

Option F1: The length of pedestrian trips would be reduced by providing neighborhood circulator transit to cover excessive walk distances.

Option F2: Land development standards would be created that break up large parking lots with landscaping; provide direct, shaded pedestrian connections from intersections and adjoining walkways to the front of shopping areas; and set maximums for number of parking spaces rather than minimums based on square footage.

Need: Walkways have little or no shade. A pedestrian in the desert needs shade in order to make the trip bearable for any distance, especially from May through October. The recommendation for shade in the region is to have 50% of the walkway surface shaded at the hottest time of the year. A lack of shade trees along Grand Avenue and intersecting streets is commonplace.

Option G1: Walkways would be detached from curbs so that trees can be added to shade pedestrians. The best locations for shading in the hottest months of the year would be evaluated

and shade trees would be added to achieve 50% shade along existing walkways. This action would also help to meet the need to improve the aesthetics of the corridor.

Need: ***Existing sidewalks are too narrow and are close to traffic. Most of the walkways in the corridor were built to the minimum MAG standard, which is an attached sidewalk, measuring 5 feet from back of curb to back of walk. Given the traffic volumes, these facilities are inadequate for pedestrians to feel comfortable and safe walking for any distance. The MAG Pedestrian Plan suggests the desired buffer area to address the latent demand, or pent up need, for comfortable pedestrian walkway space.***

Option H1: As in A2 above, walkways would be detached from the curb.

Need: ***Wide roadways are difficult to cross. Given the number of lanes for through travel and turning movements, especially on Grand Avenue, intersections have become long distances for pedestrians to cross within the allotted traffic signal timing phase. Given the age of the population in and near this corridor, pedestrians move more slowly than the average and thus create a safety concern.***

Option I1: As in D above, wherever possible, streets would be narrowed to decrease the crossing distances for pedestrians. The traffic signal phasing would be evaluated to allow for a longer crossing time for pedestrians. Pedestrian-activated buttons would be installed at ADA-accessible crossings to generate a walk signal during the normal traffic phasing. Installation of countdown walk signals to alert pedestrians to the amount of time they have to cross, as well as auditory signals for visually challenged persons would be considered. Pedestrian refuge areas in the medians, including a curb area extending on either side of the refuge to buffer pedestrians from turning vehicles would be installed.

8.4.2.1 Additional Potential Pedestrian Actions

MAG Pedestrian Plan 2000

Option J: The methodology of the MAG Pedestrian Plan 2000 to further evaluate the latent demand for pedestrian facilities would be incorporated. As a result, pedestrian counts and neighborhood level meetings may be conducted to determine the specific destinations accessed by using Grand Avenue and intersecting streets.

MAG Elderly Mobility Initiative

In 2001, MAG initiated a planning effort to understand how the dramatic increase in the number of senior Americans will affect the region. This initiative and its findings have direct applicability to the Grand Avenue Northwest Corridor because the corridor serves a number of age-restricted communities. Youngtown, Sun City, Sun City West, and Sun City Grand are all centers of retirement-age individuals. A 30-member MAG Working Group has been conducting

discussions with community groups region wide to develop a Regional Action Plan on Elderly Mobility that focuses on safety, accessibility, affordability, and independence. The draft recommendations from the Elderly Mobility Action Plan are organized into four overall categories: Infrastructure/Land Use, Alternative Transportation Modes, Older Driver Competency, and Education & Training. Recommendations for Infrastructure and Alternative Modes are the most applicable to the Grand Avenue Northwest study. The following are optional actions specific to infrastructure by which elderly pedestrians can be better served.

Option K1: As part of a review and update to the MAG Pedestrian Area Policies and Design Guidelines, this corridor would be considered as a candidate to be part of a demonstration area for designing and installing such techniques as:

- Elderly/pedestrian-friendly signage
- Turn/refuge islands
- Audible signals at crosswalks
- Improved parking lot design
- Narrow street design

Option K2: As suggested in F2 above, land use guidelines would be developed to meet the needs of an aging population in the corridor. The guidelines would be an opportunity to apply a regional approach for consistently locating services (retail, medical, social services, and recreation) in proximity to where seniors live.

Option K3: As a follow-up to this study, an on-site review of current infrastructure/land use for the corridor would be conducted and the results incorporated into the transportation review process.

8.4.3 Bicycles

The options listed below are intended to meet bicycle needs in the Grand Avenue Northwest Corridor, as identified in Chapter 7.

Need: Improved riding conditions for cyclists along the Grand Avenue corridor from SR 101L to SR 303L. The following facility types are candidates for consideration:

Option A1: A white stripe on the outside of the curb lanes would be painted to create an edge line buffer zone that may be used by bicyclists. This option requires a 16-foot wide outside lane or paved shoulders. Both sides of the road need to have the space so that bicycle travel can be provided in both directions. Some use of this option already exists in portions of the corridor especially in the El Mirage and Surprise areas. From SR 101L to 111th Avenue, however, the shoulders outside the edge stripes are generally too narrow for safe use by cyclists.

Option A2: Bike lanes would be provided along Grand Avenue. Bike lanes must be at least 6 feet wide, signed, and provided in both directions. Bike lane striping and signing increase cyclists' confidence that motorists will not stray into their path of travel, and vice versa. Bike lanes are generally preferred over other options by serious bicyclists. The lanes also help identify cycling as a viable mode of transportation. Since Grand Avenue does not and will not have on-street parking, conflicts between cyclists and parked vehicles will not be an issue. Increased motor vehicle speeds due to roadway improvements along Grand Avenue could, however, create more hazardous cycling conditions, which could be mitigated by providing some separation between the automobile travel lane and the bicycle lane. (Bike lanes on state highways is not consistent with ADOT policy.)

Option A3: A 10-foot wide bike path would be provided along Grand Avenue for use by bicyclists and pedestrians as discussed in Pedestrian Option A1. The path would not continue across signalized intersections so that both pedestrians and cyclists would have to use the crosswalks.

Bike paths are on exclusive rights-of-way with minimal cross flow by motor vehicles. According to the *Arizona Bicycle Facilities Planning & Design Guidelines*, bike paths should not be considered a substitute for the street, because many cyclists will find them less convenient than the street, especially for commute and other non-recreational trips.

A bike path, or multi-use path shared with pedestrians, would have the following advantages:

- Minimal conflicts between bicycles and motorized traffic, except at signalized intersections
- Opportunities to integrate landscaping and other amenities, improving the aesthetics of the corridor
- Availability of an alternative to bicycle operation in mixed street traffic
- A direct route connecting the proposed multi-use paths along the Agua Fria and New rivers
- A single path, if wide enough and sufficiently buffered from adjacent streets, can serve both directions of travel

Disadvantages of a bike path include the following:

- Generally not compatible with grade separations
- Not preferred by serious bicyclists due in part to conflicts with pedestrians
- Right-of-way may not be available

- Higher maintenance cost
- Bike path in state highway right-of-way is not consistent with ADOT policy

Need: Grade-separated crossings of Grand Avenue and the railroad for pedestrians and bicyclists.

Option B1: All grade-separated crossings of Grand Avenue and the BNSF Railroad would be designed to accommodate bicycles and pedestrians.

Need: A more direct route across Grand between the El Mirage and Surprise CBDs.

Option C1: On-street bike lanes or edge line buffer zones would be provided as part of the El Mirage Road/Thompson Ranch Road connector between Paradise Lane in Surprise and Grand Avenue in El Mirage. This facility would link up with the proposed El Mirage Road bikeway to the north, extending from Paradise Lane to Deer Valley Drive.

Need: Non-motorized trails, including routes along the river beds.

Option D1: The West Valley (New River) Multimodal Transportation Corridor and the West Valley Rivers/Agua Fria Corridor would be developed as non-motorized transportation and recreation corridors with appropriate amenities, including bicycle storage facilities at key locations. The multi-use path along the north edge of Surprise and within the Grand Avenue Northwest Corridor as proposed in the Surprise General Plan 2020 would also be implemented.

Need: Convenient access between the Grand Avenue Northwest Corridor and future off-street paths or trails.

Option E1: The proposed Grand Avenue multi-use path would be directly connected with the West Valley (New River) Multimodal Transportation Corridor, the West Valley Rivers/Agua Fria Corridor, and other off-road transportation/recreation corridors developed in the future. Signage would be provided indicating the connections.

Need: Bikeway connections between Grand Avenue and other regional facilities.

Option F1: Bikeway planning and development in the corridor would be coordinated with the municipalities of Surprise, El Mirage, Youngtown, Peoria, and, for unincorporated areas, with MCDOT.

Need: A continuous, interconnected bicycle network crossing jurisdictional boundaries.

Option G1: The following on-street bikeways that cross or enter the study corridor, as proposed in relevant studies or plans would be developed:

- Bike lanes or edge line buffer zones on 99th Avenue, Beardsley Road-Olive Avenue (MCDOT Bicycle System Plan)
- Bike lanes or edge line buffer zones on 103rd Avenue, Boswell Boulevard-Grand Avenue (MCDOT Bicycle System Plan)
- Bike lanes on El Mirage Road, Bell Road-Paradise Lane (Surprise General Plan 2020)
- Bike lanes on Dysart Road, Bell Road-Greenway Road (Surprise General Plan 2020)
- Bike lanes or edge line buffer zones on Litchfield Road from Bell Road south (MAG Regional Bicycle Plan)
- Bike lanes on Reems Road, Grand Avenue-Peoria Avenue (Surprise General Plan 2020)
- Bike lanes or edge line buffer zones on Thunderbird Road, Peoria City Limit to 99th Avenue (MCDOT Bicycle System Plan)
- Bike lanes or edge line stripe buffer zones on Waddell Road, Dysart Road-Cotton Lane (MCDOT Bicycle System Plan)
- Bike lanes on Greenway Road, Grand Avenue-Trilby Wash Basin (Surprise General Plan 2020)
- Bike lanes or edge line buffer zones on Bell Road, 99th Avenue-Grand Avenue (MAG Regional Bicycle Plan)
- Edge line buffer zones on Bell Road, Grand Avenue-Sun Valley Parkway (MAG Regional Bicycle Plan)
- Bike lanes on Mountain View Boulevard, Parkview Plaze-Sunrise Boulevard (Surprise General Plan 2020)

Need: Physical improvements to many railroad crossings.

Option H1: Every railroad crossing would be brought up to a minimum standard with paved trackway. A bicycle safety audit of grade crossings would be conducted in the corridor and its recommendations would be implemented. (Refer to Pedestrian Need B.)

Need: Enhanced aesthetics, comfort and amenities for bicyclists in the corridor.

Option I1: See the recommendations under Pedestrian Needs A, F and G.

8.4.4 Electric Carts

The following options are presented to address specific needs in the Grand Avenue Northwest Corridor, as identified in Chapter 7.

Need: A safe and legal route for electric carts between Sun City and Surprise/Sun City West.

Option A1: When a new vehicular route crossing the Agua Fria River between Peoria Avenue and Union Hills Drive is to be built, it would be designed to accommodate carts.

Need: Additional access between Sun City West and Surprise (including Sun City Grand).

Option B1: As the portion of Surprise southwest of Grand Avenue builds out in coming years, the needs of electric carts would be considered in the design of any new route connecting Surprise with Sun City West across Grand Avenue and the BNSF tracks.

Need: Possible signage to warn of golf cart crossings (e.g., of Grand Avenue).

Option C1: Cart crossing counts would be conducted to determine the number of these vehicles that cross Grand Avenue at signalized intersections in the Sun City, Sun City West and Surprise (Sun City Grand) areas. In cooperation with ADOT, the need for special signage at intersections with high crossing volumes of golf carts would be determined. Such signage may be advisable on Grand Avenue because of its heavy use by long-distance travelers who may not expect to see these smaller, slower-moving vehicles.

Need: Consideration of educational efforts for cart riders and other road users in areas with heavy electric cart travel.

Option D1: A program would be developed to identify and implement the most appropriate methods of educating motorists regarding their responsibility to safely share the road with slower- or faster-moving vehicles. Techniques similar to those used in motorist/bicyclist programs would be considered; e.g., the "Share the Road" signage campaign recently implemented in Phoenix.

Need: Consideration of cart access, mobility and safety as an issue in the MAG Northwest Area Transportation Study.

Option E1: As part of the MAG Northwest Study, the issue of golf carts would be addressed.

Need: Determination of feasibility of neighborhood electric vehicles (NEV) along off-street corridors.

Option F1: As recommended in the MAG Regional Off-Street System Plan (ROSS), the feasibility and potential applications of NEVs and other non-polluting motorized transportation within off-street corridors would be determined. This action would require careful consideration of the conditions in which such vehicles can safely share off-road transportation facilities with non-motorized users. The principal planned off-road corridors, such as those along the New and Agua Fria rivers, would be evaluated individually.

8.5 SUMMARY OF OPTIONS

A summary of all the options presented in this chapter are included in Exhibit 8.19.

Exhibit 8.19
Options for Improvements to Grand Avenue Northwest Corridor

	Description	Cost*	Comments
1. Roadway Improvements (based on Enhanced Arterial/Limited Expressway Alternative)			
Roadway Option			
A	Widen Grand to six lanes and meet drainage standards	$30m	9.6 miles
B	Add turn lanes to cross streets	$9m	May conflict with pedestrian improvements
Grade Separations – Access to Boswell Hospital			
C or	107th Avenue interchange	$40-$45m	Major property takes; not cost effective
D or	103rd Avenue grade separation	$24m	Significant property takes; no direct access from Grand; local funding required
E	Emergency-only	$7.5m	Hospital needs to be partner; ADOT funding questionable
Grade Separations – Access to Del E. Webb Hospital			
F or	Meeker/Reems interchange	$30m	Major property takes
G	Emergency-only	$6m	Hospital needs to be a partner; ADOT funding questionable; Location Study needed
Grade Separation – Capacity Needs			
H	Bell Road interchange	$40m	Major property takes; property access limitations
Grade Separation – Continuous Routes			
I or	El Mirage Road extend to Olive Avenue	$35m	Requires commitment from City of El Mirage and local government leadership
J or	El Mirage Road (west alignment)	$31m	Requires commitment from City of El Mirage and local government leadership
K	Greenway Road Interchange	$30m	At-grade crossing exists
L	Grand Avenue at BNSF spur	$17m	Limits access to El Mirage; not cost effective
M	Remove seven traffic signals	NA	Major impacts to commercial property and access to some neighborhoods
N	Eliminate median breaks for left turns	NA	Consider with Option A
O	Limit new access to Grand and remove existing access where feasible	NA	Policy agreement between ADOT and cities/County
2. Operational and Aesthetic Improvements			
A	Provide landscaping on side and median and street lighting	NA	Requires participation by cities/County

	Description	Cost*	Comments
B	Evaluate signage especially for elderly and disabled	NA	City/County signage should be included in study
C	Place guardrail along drainage channel	NA	Space between road and channel is very limited
D	Extend the ITS "Smart Corridor" to SR 303L	$2.5m	
E	Evaluate signal equipment and signal timing and phasing	NA	Follow-up study by ADOT
F	Evaluate all railroad crossing warning/control devices	NA	Follow-up study by ADOT
G	Evaluate signal timing for pedestrians	NA	Follow-up study by ADOT
Transit Option			
Extend Regional Bus System			
A1	Extend local bus service along Grand		Short-term
A2	Extend local bus service and add new routes on other arterials		Short-term
A3	Add on-street bus bays		Short-term
B	Improve bus stops for user comfort		Short-term
Restructure Paratransit to Better Meet Travel Needs			
C1	Develop seamless Dial-a-Ride system in Northwest Valley		Short-term
C2	Study innovative approaches to serving seniors and persons with disabilities		Short- to mid-term
D	Develop Park-and-Ride capacity near SR 101L (proposed location near Glendale Avenue/SR 101L)		Short- to mid-term
E	Improve bus and dial-a-ride services to meet regional service standards.		Mid-term
F	Develop improved alternatives for local circulation.		Short- to mid-term
G	Develop park-and-ride capacity in western portion of corridor (proposed location near Bell/Dysart).		Mid- to long-term
H	Consider express or high capacity transit (bus rapid transit, light rail, commuter rail) in corridor as extension of regional system.		Long-term
Pedestrian Option			
Improve Pedestrian Facilities Along Grand Avenue			
A1	Build shared use path on southwest side of Grand		
A2	Provide wider, detached standard walkway on intersecting streets		
B	Develop all railroad crossings to a minimum standard, with paved trackway, 8-foot walkways and ADA accessibility		

	Description	Cost*	Comments
C	Assess feasibility and neighborhood acceptance of additional gated connections through community walls		
D	Minimize channelized right turns and dual left turn lanes that make crossings more difficult for pedestrians		
E	Develop and improve pedestrian connections from the corridor to off-road trails		
Implement Measures to Reduce the Impact of Existing Development Patterns on Walk Distances			
F1	Provide neighborhood circulator transit to cover excessive walk distances		
F2	Institute land development standards to make activity centers more pedestrian-friendly		
G	Provide more shade for pedestrian comfort		
H	Provide buffers between sidewalk and curb		
I	Implement measures to make intersection crossings safer and easier, especially for the elderly		
J	Conduct pedestrian counts and neighborhood meetings to determine destinations accessed by using Grand Avenue and intersecting streets		
Options Stemming from MAG Elderly Mobility Initiative			
K1	Consider corridor for a demonstration to try out various pedestrian-friendly techniques		
K2	Develop more pedestrian-friendly land use guidelines (see F2 above)		
K3	Conduct on-site review of current infrastructure and land use, with results incorporated into the transportation review process		
Bicycle Option			
Improve Riding Conditions for Cyclists Along Grand from SR 101L to SR 303L			
A1	Create edge line buffer zones, using shoulders or 16-foot outside lanes		
A2	Provide bike lanes along Grand Avenue		
A3	Provide a 10-foot bike path, buffered from the roadway, along Grand Avenue		
B	Design all grade-separated crossings of Grand Avenue and the BNSF Railroad to accommodate bicycles and pedestrians		
C	Provide bike lanes or edge line buffer zones as part of the El Mirage/Thompson Ranch connector between Paradise Lane in Surprise and Grand Avenue in El Mirage		

	Description	Cost*	Comments
D	Develop the West Valley (New River) Multimodal Transportation Corridor and the West Valley Rivers/Agua Fria Corridor as non-motorized transportation and recreation facilities		
E	Provide direct connections between the Grand Avenue Corridor and intersecting off-road, non-motorized corridors		
F	Coordinate bikeway planning and development in the corridor with various cities and MCDOT		
G	Provide a continuous, interconnected bicycle network by building facilities recommended in previous studies and plans		
H	Conduct and implement the recommendations of a bicycle safety audit of railroad grade crossings		
Electric Cart Option			
A	Design any new vehicular route crossing the Agua Fria River to accommodate carts		
B	As the area of Surprise southwest of Grand Avenue builds out, consider the needs of electric cart users in designing any new route connecting this area with Sun City West.		
C	Conduct cart crossing counts at Grand Avenue signalized intersections to determine whether special warning signs are needed		
D	Develop a program to educate motorists on their responsibility to safely share the road with slower- or faster-moving vehicles		
E	Consider cart access, mobility and safety in the MAG Northwest Area Transportation Study		
F	Assess the feasibility of electric cart operations within off-road transportation corridors		

*Includes right-of-way and engineering costs.

9.0 RECOMMENDATIONS

9.1 RECOMMENDATIONS

The following is a list of recommendations derived from the information contained in the preceding chapters and the responses received from the stakeholders and public, and the analyses of the options. Particular attention was given to selecting actions which are consistent and avoiding those that are contradictory.

Grand Avenue:

- The ultimate concept for Grand Avenue is an enhanced arterial/limited expressway.
- It is a regional road that serves through traffic and city arterial traffic.
- The emphasis for Grand Avenue is on the movement of motorized vehicles, and therefore, not on pedestrians, bicycles, or local transit if it hinders traffic.
- Full access control and removal of all signals would have major cost and land use impacts that do not appear acceptable to the communities.

Basic Highway Features for Grand Avenue:

- Six lanes.
- Add turn lanes at intersections.
- ITS including signal coordination and traffic monitoring.
- Signal timing study.
- Evaluate railroad crossings for safety and Americans with Disabilities Act (ADA) compliance.
- Landscaping.
- Street lighting.
- Prepare implementation plan for signage designed for elderly drivers based upon state and national research and coordinated with local jurisdictions.
- Place guardrail or barrier along drainage channel that is adjacent to travel lanes on Grand Avenue.
- Support construction of SR 303L and the arterial grid to divert traffic from Grand Avenue.

- *Add right-turn lanes to commercial areas where feasible.
- *Close median openings at non-signalized locations where feasible.

Transit Improvements:

- Encourage creation of a regional funding source, enabling implementation of a multi-jurisdictional transit system in the Northwest Valley.
- Develop an integrated Dial-A-Ride system covering Northwest Valley communities.
- Extend metropolitan transit system along arterials in corridor area in accordance with a master plan for bus service to be developed at a future date.
- Develop Park-and-Ride lots in accordance with MAG plan.
- If express bus service is extended into the corridor area, express buses can operate on Grand Avenue in mixed use travel lanes.
- Study innovative approaches to serving seniors and persons with disabilities.
- Monitor the MAG High Capacity Transit Study and its potential impact on the corridor area.
- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering transit needs.
- Bus stops on Grand should be restricted to locations with safe pedestrian access to and from adjacent communities. Stops should have bus bays where feasible and connect to pedestrian walkways from adjacent neighborhoods.

Pedestrian Improvements:

- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering pedestrian needs.
- If new grade separations are constructed along Grand Avenue, pedestrian travel across Grand should be considered in the design of the grade separations.
- All new street improvements should meet ADA requirements for pedestrian travel.
- Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.

*Added in response to local agency feedback during consultation on the initial draft recommendations.

- Within cities and neighborhoods away from Grand Avenue, local governments should look for ways to enhance pedestrian travel such as reducing length of crosswalks, separating sidewalks from the street curb, and providing shade for walkways.
- Local governments should revise land development standards to enhance pedestrian movements within activity centers.

Bicycle Improvements:

- With the emphasis on the movement of motorized vehicles on Grand Avenue, efforts should be made to avoid the creation of safety conflicts while considering bicycle needs.
- Bicycle movements along Grand Avenue may be accommodated on shoulders or wider outside travel lanes through the shared roadway concept in accordance with ADOT Policy MGT 02-1 dated March 1, 2002.
- *Explore options with BNSF to provide a bicycle path within their right-of-way.
- If new grade separations are constructed along Grand Avenue, bicycle travel across Grand should be considered in the design of the grade separations.
- Encourage the development of the West Valley non-motorized transportation and recreation corridor.
- Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. Locations other than Grand Avenue should be emphasized.

Electric Cart Improvements:

- Consider the needs of cart travel in the design of new routes and grade separations.
- Local governments should conduct a follow-up specific study to develop recommendations for signage, lane markings, and site development standards to accommodate cart needs.
- Continue to limit golf carts to lower speed streets to minimize safety issues. Evaluate limiting carts to streets with speed limits less than 35 mph (current law permits carts on streets up to 35 mph).

*Added in response to local agency feedback during consultation on the initial draft recommendations.

Longer Term Potential Grade Separations:

The following potential grade separations or interchanges have merit but need more detailed engineering, cost analyses, and impact assessment before a final decision is made to proceed. If constructed, each one is expected to require the removal of existing businesses and in some cases residential units. The design of all grade separations should consider alternative mode needs. Some traffic signals and access points along Grand Avenue that were placed to serve retail centers may have to be removed.

- Extension of El Mirage Road to Olive, with a grade separation interchange at Grand Avenue. Several potential locations may be considered. This proposed roadway would be part of the city/county road system.
- Meeker/Reems grade separation interchange or emergency access grade separation. This facility would primarily benefit local community travel so local funding participation would be expected.
- 103rd Avenue grade separation. This facility would provide a linkage between north and south Sun City for motorized and non-motorized travel. It would almost exclusively benefit local community travel so local funding would be expected.

Plan Updates:

Based on the recommendations presented above, the following elements of the MAG Long Range Transportation Plan should be updated: freeways, streets, transit, pedestrian, bicycle, ITS, and elderly mobility.

9.2 PRIORITY RECOMMENDATIONS

Action elements of the recommendations are grouped into three priority categories as described below.

Priority One

The most important element of the recommendations for the Grand Avenue Northwest Corridor is to construct Grand Avenue as a six-lane roadway with a raised median. The proposed roadway cross section includes 10-foot outside shoulders where right-of-way is available. These shoulders would be available for use by bicyclists. To accomplish this action, ADOT will need to proceed with a Design Concept Report (DCR) and environmental documentation. Through this process, a signal timing study and railroad crossing evaluation can be conducted to determine what elements would be included in the overall design concept. In addition, the specific plans for the ITS Smart Corridor can be incorporated into the overall action plan and phasing plan for Grand Avenue. Through the DCR process, the determination of the intersection improvements will be made with consideration for non-motorized travelers and transit as appropriate. Similarly, the

basic agreements between ADOT and local governments will be developed regarding landscaping and lighting. The concepts for providing a barrier along the drainage channel should also be incorporated. Final design and construction of these improvements will be dependent on identification of a funding source, programming the actions into the improvement program, and scheduling the implementation.

Studies should be conducted to determine the most appropriate action to provide emergency vehicle service across the railroad to the two major hospitals. The top priority is a grade separation for access to Del E. Webb Hospital near Meeker/Reems intersection with Grand Avenue. Implementation of these items will be dependent on the solution chosen, identification and commitment of a funding source, and agency sponsorship.

The proposed El Mirage Road grade separation and extension southward and other potential options should be further evaluated in the Northwest Transportation Study.

In order to advance the development of the transit system in the area, a funding source must be identified. Ideally, this funding source would span across jurisdictional boundaries so that a unified system can be implemented. The local communities are urged to work toward this end.

The existing law limiting cart usage on streets with speed limits of 35 mph or less should be retained.

The above actions are recommended for completion in the near term depending on the availability of funding.

Priority Two

When the regional (or other) source for funding is identified, an integrated dial-a-ride system should be developed along with extension of the metropolitan bus system along the arterials. The park-and-ride lot slated for the general area of Bell Road and Grand Avenue should also be implemented.

The local communities should encourage and financially participate in the development of the non-motorized transportation and recreation corridors planned along the rivers and the connection of these corridors to the residential area. Connections should be provided for pedestrians and bicyclists.

Local governments should also follow up on studies and action plans for specific signage and marking needs designed specifically for the senior population and for the specific needs for carts.

Priority Three

As part of a more long-term program, grade separations at El Mirage, Meeker/Reems, and at 103rd Avenue have been suggested. Further studies should be conducted to help further define

the concepts to be advanced at each location. Implementation of these grade separations will depend upon the availability of funding and the support and sponsorship of the local governments. The need for the grade separations should be further identified in the Northwest Area Transportation Study and updated periodically as future developments in the area become better defined.

Long-Term Needs

The Bell Road/Grand Avenue intersection will be improved as part of the Priority One basic highway improvements (additional lanes, no grade separation). As development continues and other improvements are made outside the corridor, the traffic at this intersection should be monitored to determine when or if additional improvements may be needed.

9.3 ESTIMATED COST

General cost estimates were made for some of the major recommended roadway improvements. The estimates include the cost of right-of-way and are based on unit cost in 2001. These estimates are very preliminary and may change substantially based on more detailed engineering and project development. Additional definition is needed for the transit, pedestrian, bicycle, and electric cart projects before reliable cost estimates can be made. Estimates of costs for transit and other alternative modes are expected as part of the MAG Northwest Area Transportation Study. Projects from this list or other projects from the list of recommendations above may be recommended for funding as part of the MAG RTP process.

Recommended Improvement	Cost (in millions)	Responsible Agency
Priority One		
• Widen Grand Avenue to six lanes	$30	ADOT
• Add turn lanes on cross streets	$9	Local Jurisdictions
• Intelligent transportation systems	$2.5	ADOT/Regional/Local Jurisdictions
• Meeker/Reems grade separation interchange or	$30	ADOT/Regional/Local Jurisdictions
Emergency-only grade separation	$6	Local Jurisdictions/Private/ Regional
Priority Three		
• El Mirage Road grade separation and extension	$35	ADOT/Regional/Local Jurisdictions
• 103rd Avenue grade separation	$24	ADOT/Regional/Local Jurisdictions

10.0 PUBLIC INVOLVEMENT

The Grand Avenue Northwest Corridor Study was designed to directly involve the communities and citizens that are affected by the Corridor. A public involvement plan was prepared on October 10, 2000. There were three levels of involvement: (1) two public meetings; (2) six agency/community forums; and (3) direct contact with agencies and individuals. Each of these levels are described below.

10.1 PUBLIC MEETINGS

Two public meetings were held in the West Valley Art Museum in Surprise, Arizona. The first meeting was held on September 27, 2000 and the second on April 29, 2002. Letters were sent to the project mailing list, and public service announcements were sent to the broadcast and print media. Each meeting was well attended.

At the first meeting, a questionnaire was given to all attendees requesting that each person rate the importance of a series of transportation issues that had been identified to date for the corridor. The results of the questionnaire are included in Exhibit 10.1.

At the second meeting a questionnaire was given to all attendees requesting that each person rate their agreement with the proposed recommendations. A total of 25 responses was received, and the tabulation is provided in Exhibit 10.2. Not everyone responded to every recommendation. Almost all recommendations received "strongly support" or "somewhat support." The one exception was recommendation 35 which indicated that bicycles would be able to "Share the Road" through the use of shoulders on Grand Avenue. It is believed that many responders are concerned about the safety of bicyclists on Grand Avenue given the volume and speed of traffic. ADOT has indicated that they would not exclude bicyclists from using the road, and there is insufficient right-of-way and no funding for a separate bicycle path. As a result, no change in the recommendation was made.

Other recommendations that received mixed reviews include 28, 29, 36, 40, and 41. These recommendations had to do with giving consideration to pedestrians, bicyclists, and electric carts in the design of any new grade separation, meeting ADA requirements, and special treatments for electric carts. All of these recommendations will require follow-up studies and approvals. As a result, no changes in the recommendations were made.

Three letters were received from commercial interests near Grand Avenue and Bell Road opposing the removal of traffic signals that provide access to their property.

A comment was received from the City of Glendale requesting Grand Avenue be planned as a "controlled access" facility to enhance future funding opportunities.

Exhibit 10.1
Responses to Questionnaire from
September 27, 2000 Public Meeting

Issue	Average Score
Providing improved crossings of Grand and the railroad	4.66
Improving access to the hospitals	4.52
Coordinating signals along Grand	4.50
Improving emergency vehicle access to and from Grand	4.40
Reducing congestion at intersections	4.19
Expediting travel along Grand	4.14
Providing lane continuity along Grand	3.89
Providing noise abatement	3.81
Improving aesthetics/landscaping	3.67
Providing routes to divert traffic from Grand	3.52
Improving access to and from Bell Road	3.48
Improving lighting along Grand	3.44
Providing more/better directional or informational signage	3.41
Maintaining existing access to Grand	3.37
Enhancing elderly mobility	3.24
Providing access to new shopping centers	3.16
Enhancing pedestrian and bicycle travel	2.78
Providing bus stops on Grand	2.72
Providing park-and-ride lots	2.17

Question #1: Do you have any additional issues, concerns, or related comments related to the Grand Avenue between SR 101L and SR 303L (for example, specific safety improvements or elderly mobility issues)?

Comments	# Received
Need Historical Markings (Stagecoach Stations, etc.) Should talk to historic group	1
Aesthetic zoning commercial buildings and advertisements?	1
Sun City Route 60 is just impossibly bad	1
Need El Mirage Interchange and continuance of El Mirage Road onto Olive at least. Possibly an alignment with 115th Avenue on down to I-10	1

Exhibit 10.1 (continued

Comments	# Received
Extend frontage roads especially at the shopping centers	2
Noise and air pollution due to excessive traffic	2
No way to cross railroad tracks for emergency vehicles between Routes 101 and 303 at all times. Need one (overpass/underpass) somewhere near Boswell Hospital and Del Webb Hospital	3
Safety – big concern	3
People get confused on Grand	1
Adequate ingress/egress to Grand	1
Make it look good so it can attract new businesses	2
Hiking/biking groups should be advised to look at recreation corridors along the dry river beds	1
I do not believe pedestrians or golf carts should be allowed on Grand	1
Improve left turn between Grand and Olive at 75th Avenue	1

Question #2: What type of improvements would you like to see along Grand Avenue between SR 101L and SR 303L?

Comments	# Received
Do it correctly	1
Continue to make Grand Avenue as much of an expressway as possible	1
Some cross streets have to remain	1
Make access to 101 north	1
Cut traffic flow on Bell Road from the west area as much as possible	1
Reduce speed bumps along Santa Fe Drive behind Boswell Hospital	1
Control noise, air pollution and excessive truck traffic	2
Install dotted lines at turns through intersection so people don't get confused	2

Exhibit 10.1 (continued)

Comments	# Received
Please consider that the rate of elderly users to younger users of Grand Avenue is rapidly changing to the younger user	1
Improved traffic flow on Grand Avenue	1
Grade separate Grand Avenue and Bell Road	1
Overpasses at Reems/Meeker and 91st Avenue	1
Have an on- and off-ramp at 111th Avenue	1
Do something about the drainage channel – culverts, landscaping, etc.	1
Need much more improved landscaping	2

Comments from Question & Answer Session and During Open House

Q. Can BNSF RR accommodate passenger traffic as a way to move people?

A. BNSF RR has limited track capacity and freight delivers are expected to increase; therefore, it is unlikely that passenger rail will occur on existing tracks.

C. Youngtown is concerned about access to existing businesses and the fire station. Access should be maintained to 111th Avenue, 111th Drive, and 113th Avenue.

C. Access to the hospitals is a concern.

Q. Rail service is inadequate. There is no passenger light rail. Is there right-of-way available for future lines? Can light rail serve this area?

A. Right-of-way south of SR 101L is limited to <100 feet in some places leaving no room for light rail without taking existing travel lanes. Light rail is planned to Bethany Home Road and 19th Avenue with a possible extension to Glendale. Additional routes could be considered in the future.

C. Along Bell and Grand, limit direct access to new commercial parcels. Use frontage roads instead. New signals are also needed.

C. Access to Sun City West across Grand and RR at Meeker is a concern. need a grade separation over RR tracks.

C. Consider pre-emption at signals for emergency vehicles.

C. Consider improving Olive Avenue and then divert traffic off of Grand Avenue onto Olive Avenue at 75th Avenue. The left turn at the intersection needs to be improved.

Exhibit 10.1 (continued)

C. Need landscaping to enhance area and encourage revitalization of the economic base. Use Flagstaff railroad corridor as an example.

C. Signal timing is not long enough to allow pedestrians to cross the street.

Q. What is the accident rate on Grand compared to other corridors?

A. Accident rates for Grand will be explored.

C. SR 303L extension will have limited use.

C. Allow no truck traffic on 303.

C. Keep 303 as a two-lane roadway.

C. Construction on 303 will begin soon.

Q. What are truck traffic projections on SR 303L?

A. Truck projections on SR 303L will be explored.

Q. If 303 is designated a parking, can truck traffic be restricted?

A. Truck traffic is usually not restricted on state highways. Local ordinances can limit truck usage. There are weight limits on state highways.

C. Sun Valley Parkway was built by private developers.

C. Any action to make improvements has other effects. Too much planning occurs in isolation. Need more meetings. Need to be more comprehensive. Need to acknowledge diversity of modes. What are the barriers? Provide more choices of modes. May not need six travel lanes on Grand.

Q. How many small groups, cities and homeowners' association are involved? Need more outreach to group.

A. The project team will make presentations to interested groups. The agency/community forum included representatives from the cities and homeowner associations.

C. Greenway is a good place to cross Grand Avenue on a bicycle.

C. Possible old Butterfield Stage Coach Station north of the Agua Fria Bridge.

C. El Mirage dead ends at Grand. It should pass over Grand and proceed to Olive Avenue.

C. Grand Avenue should become an expressway.

Exhibit 10.2
Responses to Questionnaire from
April 29, 2002 Public Meeting

The following is a list of preliminary conclusions prepared by the consultant team. These conclusions were derived from the information contained in the eight working papers, the responses received to date from the stakeholders and public, and the consultant analyses of the options. Particular attention was given to selecting actions which are consistent and avoiding those that are contradictory.

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
Grand Avenue					
1. The ultimate concept for Grand Avenue is an enhanced arterial/limited expressway.	11	7	3	3	1
2. It is a regional road that serves through traffic and city arterial traffic.	15	6	2	1	
3. The emphasis for Grand Avenue is on the movement of motorized vehicles and, therefore, not on pedestrians, bicycles, or local transit if it hinders traffic.	16	4	2	1	1
4. Full access control and removal of all signals would have major cost and land use impacts that do not appear acceptable to the communities.	9	4	3	3	2
5. Other options from Working Paper #8:	4				
Basic Highway Features for Grand Avenue					
6. Widen to six lanes and upgrade drainage system.	21	3			1
7. Add turn lanes at selected intersections (dual lefts, right-turn lanes).	17	4	2		1
8. Extend ITS Smart Corridor including signal coordination and traffic monitoring.	16	1	4		1
9. Conduct signal timing study.	13	5	5		1
10. Evaluate RR crossings for safety and ADA compliance.	13	3	5		1
11. Landscaping provided by local governments in cooperation with ADOT.	11	2	6	3	2
12. Street lighting provided by local governments in cooperation with ADOT.	10	4	3	3	1
13. Evaluate signage designed for elderly drivers and coordinated with local jurisdictions based upon state and national research.	9	5	5	1	
14. Place guardrail or barrier along drainage channel that is adjacent to travel lanes on Grand Avenue.	4	8	6	2	
15. Support construction of SR 303L and the arterial grid to divert traffic from Grand Avenue.	17	2	1		3
16. Other options from Working Paper #8:	2				

Exhibit 10.2 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
Transit Improvements					
17. Encourage creation of a regional funding source, enabling implementation of a multi-jurisdictional transit system in the Northwest Valley.	16	2	2	1	
18. Develop an integrated Dial-A-Ride system covering Northwest Valley communities.	5	8	6		1
19. Extend metropolitan transit system along arterials in corridor area in accordance with a master plan for bus service to be developed at a future date.	13	4	3	1	
20. Develop Park-and-Ride lots in accordance with MAG plan.	8	4	7		1
21. If express bus service is extended into the corridor area, express buses can operate on Grand Avenue in mixed use travel lanes.	9	5	2	4	2
22. Study innovative approaches to serving seniors and persons with disabilities.	7	6	5	2	1
23. Monitor the MAG High Capacity Transit Study and its potential impact on the corridor area.	10	4	5		1
24. With the emphasis on the movement of motorized vehicles on Grand Avenue, local bus service on Grand Avenue should not be a priority to avoid hindering traffic.	11	6	1	3	1
25. Bus stops on Grand should be restricted to locations with safe pedestrian access to and from adjacent communities. Stops should have bus bays where feasible and connect to pedestrian walkways from adjacent neighborhoods.	12	6			2
26. Other options from Working Paper #8:	1				
Pedestrian Improvements					
27. With the emphasis on the movement of motorized vehicles on Grand Avenue, pedestrian movements along or across Grand Avenue should not be a priority to avoid the creation of safety conflicts.	13	6		1	3
28. If new grade separations are constructed along Grand Avenue, pedestrian travel across Grand should be considered in the design of the grade separations.	6	7	4	3	3
29. All new street improvements should meet ADA requirements for pedestrian travel.	8	4	6	2	1
30. Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.	12	4	3	2	1
31. Within cities and neighborhoods away from Grand Avenue, local governments should look for ways to enhance pedestrian travel such as reducing length of crosswalks, separating sidewalks from the street curb, and providing shade for walkways.	11	6	4	1	

Exhibit 10.2 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
32. Local governments should revise land development standards to enhance pedestrian movements within activity centers.	12	5	2	1	1
33. Other options from Working Paper #8:					
Bicycle Improvements					
34. With the emphasis on the movement of motorized vehicles on Grand Avenue, bicycle movements along or across Grand Avenue should not be a priority to avoid the creation of safety conflicts.	13	1	2	5	3
35. Bicycle movements along Grand Avenue may be accommodated on shoulders or wider outside travel lanes through the share-the-road concept.	3	2	6	4	9
36. If new grade separations are constructed along Grand Avenue, bicycle travel across Grand should be considered in the design of the grade separations.	5	5	7		6
37. Encourage the development of the West Valley non-motorized transportation and recreation corridor.	12	4	4		
38. Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.	13	6	3		1
39. Other options from Working Paper #8:					
Electric Cart Improvements					
40. Consider the needs of cart travel in the design of new routes and grade separations.	5	7	8	1	3
41. Local governments should conduct a follow-up specific study to develop recommendations for signage, lane markings, and site development standards to accommodate cart needs.	8	5	5	3	2
42. Retain existing laws that prohibit golf carts on streets with speed limits greater than 35 mph, including Grand Avenue.	19	4	1		
43. Other options from Working Paper #8:					
Longer-Term Potential Grade Separations					
The following potential grade separations or interchanges have merit but need more detailed engineering, cost analyses, and impact assessment. Each one is expected to require the removal of existing businesses and in some cases residential units. Some traffic signals along Grand Avenue that were placed to serve retail centers may have to be removed.					
44. Grade separation interchange at Grand and Bell. This is the busiest intersection and the first priority for a grade separation to relieve congestion.	14	3			5
45. Extension of El Mirage Road from Thompson Ranch Road to Olive, with a grade separation interchange at Grand Avenue. This proposed roadway would be part of the city/county road system and local governments should take the lead in implementation.	11	3	3		5

Exhibit 10.2 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
46. Meeker/Reems grade separation interchange or emergency access grade separation to Del E. Webb Hospital. This facility would primarily benefit local community travel so local funding participation would be required.	10	2	3	3	4
47. 103rd Avenue grade separation. This facility would provide a linkage between north and south Sun City for motorized and non-motorized travel. It would almost exclusively benefit local community travel so local funding would be required.	10	3	4	1	4
48. Other options from Working Paper #8:					
Overall Recommendations (Please give your evaluation of the overall package of improvements presented)	**4**	**3**			

QUESTIONS & ANSWERS FROM NW GRAND PUBLIC MEETING

April 29, 2002, 6:00 PM, West Valley Art Museum

The following questions and answers were recorded during Dave French's (URS Project Manager) presentations on the recommended options for the Grand Avenue Northwest Corridor:

Surprise Mayor Shafer: Lives can be lost enroute to Del Webb Hospital waiting 15 minutes for a train to pass. "How much is a life worth?"

A: The study tentatively recommends two grade separations, but no funding is currently available. Where will the money come from? Can Surprise contribute?

Q: Would the railroad help pay for these grade separations?

A: Probably not, although the railroad will pick up a 5% share for elimination of at-grade crossings. Local funding is the key.

Q: How high a priority are the proposed grade separations?

A: They are priority 3 (lowest) because of their high cost. Four grade separations will cost more than all the other improvements combined.

Q: What's the estimated cost of the whole package?

A: The costs haven't been totaled yet, but the grade separations are roughly $40 million each. The mainline widening plus minor roadway improvements are $30-$40 million total.

Q: How much of this package is funded?

A: None. D. French summarized the MAG programming process.

Mayor Shafer: How will Grand Avenue improvements east of 101 help in the Surprise area?

A: They will substantially reduce overall travel times on Grand, as the portion east of Loop 101 is the most congested with the longest delays.

Q: Why has there been no action yet, despite ten years of studies?

A: No improvement plan has been adopted for this segment. A 1997 corridor study from Van Buren Street to Loop 303 deferred any decision on the segment west of 101.

Q: Who's funding the eight grade separations east of 101?

A: ADOT.

Q: So why doesn't ADOT fund improvements farther west?

A: ADOT may fund widening and partially fund some grade separations, based on recommendations of this study.

Q: How will Grand connect to I-17?

A: Future Loop 303 will probably connect via the Lone Mountain Corridor. There will be no direct connection of Grand to I-17 at the Phoenix end.

Q: Who's funding this study?

A: MAG, with federal planning funds covering part of the cost.

Q: Since Grand is a US highway, doesn't that make it eligible for federal funding?

A: Grand is eligible for federal funds, but no more so than many other routes that lack a US highway designation. Federal money for Grand Avenue improvements would come out of the pre-established total available to the region.

Q: How does this study affect the highway west of 303?

A: In a separate project, ADOT is widening US 60 to a four-lane divided facility from 303 to Morristown.

Q: As a major highway, can Grand Avenue provide safe transportation for nuclear waste enroute to Yucca Mountain?

A: Urban freeways like Loop 303 would take through traffic off Grand and offer safer routes for hazardous materials.

Q: Can hazardous materials be rerouted west of the White Tanks to avoid populated areas?

A: MAG has identified a route for the Canamex Corridor west of the White Tanks. However, this route is a very long-term project, because it would be costly to build but carry little traffic.

Q: Why is ADOT spending money on the Wickenburg bypass while ignoring Canamex? Unlike other states, Arizona has no designated routes for hazardous materials. Canamex may never be built.

A: Freeways are the safest roads, so funding and completion of 303 are important. Loop 303 would remove about 15,000 vehicles per day from Grand.

Comment: 303 is a two-lane interim road—not a freeway suitable for hazardous materials.

A: 303 is planned, although not yet fully funded, as a freeway from MC 85 to I-17.

Comment: The Sun Valley Parkway could solve the problem.

Q: How long has the project development process on US 60 from I-17 to Loop 101 lasted?

A: About five years so far. The original corridor study was done in 1997, followed by the MIS in 1999. Four grade separations are now in final engineering, two are in construction, and two are in right-or-way acquisition.

Q: What will be the height of the raised median west of the Agua Fria River?

A: Curb height.

Q: Is additional funding needed to complete Loop 303?

A: Yes, either an extension of the 1/2 cent freeway sales tax or some other dedicated source.

Q: What is the priority of Loop 303?

A: It is not part of the existing sales tax program, but would receive the highest priority (along with the South Mountain Freeway) for funding from an extension of the tax.

Q: How would the proposed El Mirage/Thompson Ranch grade separation affect the Agua Fria River and adjoining dump?

A: The suggested alignment passes west of the river and dump.

Q: For grade separations, wouldn't bridges be more economical than underpasses?

A: Bridges may be cheaper in some cases, but they must clear the railroad track (which already has a raised profile) by 23.5 feet. This would result in more property takings and disruption, since a greater vertical separation requires a longer structure.

Q: Who controls the signals on Grand Avenue and Bell Road?

A: ADOT has the ultimate authority on Grand, although local governments typically request the signals. Local jurisdictions have authority over Bell Road.

Q: Why has ADOT allowed so many new signals on Grand in the last few years?

A: The signals were requested by local governments and met ADOT standards for spacing.

Q: Is this project studying the Loop 303 extension to I-17?

A: That's a separate URS contract with ADOT.

Q: Is more information on the 303 study available?

A: The study is just starting so there's not much information. See D. French to get on the mailing list.

Q: Has the project team done a cost comparison with lowering the railroad tracks throughout the corridor?

A: No, but the cost would be very high, especially because the railroad would have to remain in operation while a trench is constructed. River crossings are another problem.

Q: Wasn't the interim Loop 303 facility supposed to be completed to Lake Pleasant Road by June 2002 by the County?

A: (from MCDOT): Construction from Grand Avenue to Lake Pleasant Road will occur in two phases starting this year. D. French: Peoria will improve Lake Pleasant Road to serve as a temporary 303 extension.

Q: Are the proposed underpasses in floodplains?

A: All have a drainageway that needs to be dealt with. 107th Avenue is the approximate dividing line between the Agua Fria and New River drainages.

Q: Why not punch more arterials through for longer distances, thus relieving congestion and providing more direct travel routes?

A: Some communities, such as Sun City West, were designed to block through traffic. As an example, the community killed a proposal to tie Deer Valley Drive into Loop 303 north of Grand. On the other hand, MAG (in the Northwest Valley study) and several communities are evaluating their future roadway development needs.

Rejoinder: Why not reroute people instead of overloading Grand? We need to bite the bullet and build more roads.

Q: We've heard that nothing will be done to El Mirage Road until the large developers to the north start developing. Some 100,000 homes are proposed.

A: (from County staff): Our first priority is Loop 303. Then El Mirage Road will be studied.

10.2 AGENCY AND COMMUNITY FORUMS

MAG member agencies and affected public and private groups were invited to attend the forums. Agencies and groups that attended one or more forums include the following: cities of Surprise, El Mirage, Peoria, Glendale, Phoenix, and Goodyear; towns of Youngtown, Litchfield Park, Wickenburg, and Guadalupe. Other agencies included Maricopa Association of Governments, Arizona Department of Transportation, Federal Highway Administration, Maricopa County Department of Transportation, and the Regional Public Transportation Agency. Stakeholders that participated included Sun City West-Property Owners and Residents Association, Sun City-Home Owners Association, Sun City Grand Community Association, Burlington Northern Santa Fe Railroad, and SunHealth Systems.

Forums were held on July 28, 2000 (kick-off meeting); November 14, 2000; February 26, 2001; March 20, 2002; June 12, 2002; and November 5, 2002. The meetings were held at the MAG offices or the Surprise City Hall.

A questionnaire was presented to the attendees at the February 26, 2001, forum. This questionnaire was designed to obtain a sampling of agency opinions regarding several improvement ideas for the Grand Avenue Northwest Corridor. The results of the questionnaire are summarized in Exhibit 10.3. If more than one questionnaire was submitted from an agency, the results were averaged.

At the March 20, 2002, forum, a questionnaire was presented requesting attendees to rate their degree of agreement with preliminary consultant recommendations. The results are included in Exhibit 10.4. If more than one questionnaire was submitted from an agency, the results were averaged.

10.3 OTHER CONSULTATIONS

The consultant team and MAG staff met with several of the more directly affected agencies and stakeholders to discuss ideas and preliminary recommendations. Specific meetings were held as follows: Surprise, El Mirage, Sun City West Property Owners and Residents Association, and Sun City Home Owners Association; ADOT; and SunHealth Systems. A meeting with developers and landowners was held April 29, 2002. Other consultation feedback was received through letters and e-mails.

Exhibit 10.3
Responses to Questionnaire from
February 26, 2001 Agency/Community Forum

Potential Improvements to Grand Avenue (SR 101L to SR 303L)

In Favor	Neutral	Not in Favor		
9	2		(1)	Widen Grand Avenue to six through lanes and provide exclusive turn lanes at signalized intersections. Includes widening/reconstructing the existing bridge over the New River.
8.5	2.5		(2)	Extend the Intelligent Transportation System "Smart Corridor" along Grand from Bell Road to SR 303L. Includes signal coordination.
8	1	2	(3)	Single Point Urban Interchange (SPUI) at Grand Avenue/107th Avenue intersection (107th Avenue passes under Grand and RR to provide improved access to Boswell Memorial Hospital).
6	5		(4)	Half diamond and T-intersections at Grand Avenue/Thompson Ranch Road intersection (El Mirage Road connection passes over Grand and RR).
6	2	2	(5)	Grand Avenue underpass at BNSF Railroad spur track.
5	4	1	(6)	Tight diamond at Grand Avenue/Greenway Road intersection (Greenway Road passes under Grand and the RR).
8	2		(7)	Tight diamond at Grand Avenue/Bell Road intersection (Bell passes under Grand and RR).
6	2	2	(8)	SPUI at Grand Avenue/Reems Road intersection (Reems Road passes under Grand and RR to provide improved access to Del E. Webb Memorial Hospital).

Exhibit 10.3 (continued)

In Favor	Neutral	Not in Favor		
			Elimination of traffic signals along Grand Avenue including:	
4	4	3	(9)	Parkview Place (too close to Reems/Meeker interchange)
6	3.5	1.5	(10)	Primrose Street (within Grand Avenue depressed section)
3	4	4	(11)	Home Depot (too close to Bell Road interchange)
3	6	1	(12)	Planned signal to shopping center (too close to Bell Road interchange)
3	6	2	(13)	113th Avenue (too close to 111th Avenue)
5	1	2	(14)	Policy to limit future access to Grand Avenue.
			Eliminate access along Grand Avenue including eliminating median breaks at the following unsignalized intersections:	
4	4	1	(15)	Beardsley Road
4	4	1	(16)	Sunny Lane
4	4	1	(17)	Shopping Center, east of Greenway Road
4	4	1	(18)	108th Avenue
4	4	1	(19)	106th Avenue
4	4	1	(20)	105th Avenue
4	4	1	(21)	101st Avenue
4	4	1	(22)	Median Break, east of 99th Avenue

Exhibit 10.4
Responses to Questionnaire from
March 20, 2002 Agency/Community Forum

The following is a list of preliminary conclusions prepared by the consultant team. These conclusions were derived from the information contained in the eight working papers, the responses received to date from the stakeholders and public, and the consultant analyses of the options. Particular attention was given to selecting actions which are consistent and avoiding those that are contradictory.

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
Grand Avenue					
49. The ultimate concept for Grand Avenue is an enhanced arterial/limited expressway.	5		2	1	1
50. It is a regional road that serves through traffic and city arterial traffic.	5		1	1	
51. The emphasis for Grand Avenue is on the movement of motorized vehicles and, therefore, not on pedestrians, bicycles, or local transit if it hinders traffic.	4	2.5	0.5	2	
52. Full access control and removal of all signals would have major cost and land use impacts that do not appear acceptable to the communities.	3	3.5	1.5		1
53. Other options from Working Paper #8: **(Surprise)** Landscaping; cover channel; Meeker/Reems interchange; express transit; light rail; Bell Road interchange **(RPTA)** Pipe existing drainage channel; will allow roadway to be shifted away from BNSF ROW **(Glendale)** Frontage roads for access to local businesses/new developments **(Unknown)** Prefer full expressway	2.5	0.5			
Basic Highway Features for Grand Avenue					
54. Widen to six lanes and upgrade drainage system.	7.5	1			
55. Add turn lanes at selected intersections (dual lefts, right-turn lanes).	6.5	0.5	1	1	
56. Extend ITS Smart Corridor including signal coordination and traffic monitoring.	8.5	0.5			
57. Conduct signal timing study.	8	1			
58. Evaluate RR crossings for safety and ADA compliance.	7	2			
59. Landscaping provided by local governments in cooperation with ADOT.	3	2	3	1	

Exhibit 10.4 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
60. Street lighting provided by local governments in cooperation with ADOT.	3.5	2.5	2	1	
61. Evaluate signage designed for elderly drivers and coordinated with local jurisdictions based upon state and national research.	3.5	5	0.5		
62. Place guardrail or barrier along drainage channel that is adjacent to travel lanes on Grand Avenue.	2	3.5	2.5	1	
63. Support construction of SR 303L and the arterial grid to divert traffic from Grand Avenue.	5	3	1		
64. Other options from Working Paper #8: **(Surprise)** (Re 11) ADOT to support enhancement funding partnership (Re 14) Prefer to cover channel; guardrail is second choice Conduct pedestrian counts **(PORA)** (Re 15) … but not as substitute for CANAMEX which must go west of White Tanks **(Glendale)** Also add medians for improving traffic flow (Re #11 and #12) Support landscaping and lighting but not funded by local government Add medians to promote smoother flow of traffic **(RPTA)** Conduct urban design study for Grand Avenue corridor (lighting, signage)	2	1			
Transit Improvements					
65. Encourage creation of a regional funding source, enabling implementation of a multi-jurisdictional transit system in the Northwest Valley.	5	2	2		
66. Develop an integrated Dial-A-Ride system covering Northwest Valley communities.	4	3	2		
67. Extend metropolitan transit system along arterials in corridor area in accordance with a master plan for bus service to be developed at a future date.	4	2.5	2.5		
68. Develop Park-and-Ride lots in accordance with MAG plan.	3.5	3.5	2		
69. If express bus service is extended into the corridor area, express buses can operate on Grand Avenue in mixed use travel lanes.	3	3.5	0.5	2	
70. Study innovative approaches to serving seniors and persons with disabilities.	4.5	2	1.5	1	

Exhibit 10.4 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
71. Monitor the MAG High Capacity Transit Study and its potential impact on the corridor area.	4.5	2	2.5		
72. With the emphasis on the movement of motorized vehicles on Grand Avenue, local bus service on Grand Avenue should not be a priority to avoid hindering traffic.	3.5	1.5	0.5	3.5	
73. Bus stops on Grand should be restricted to locations with safe pedestrian access to and from adjacent communities. Stops should have bus bays where feasible and connect to pedestrian walkways from adjacent neighborhoods.	4	4	1		
74. Other options from Working Paper #8: **(Surprise)** City has dial-a-ride Use of BNSF R/W for light rail **(Unknown)** Light rail **(RPTA)** Road alignment should allow sufficient room for bus stops that will not encroach on BNSF	3				
Pedestrian Improvements					
75. With the emphasis on the movement of motorized vehicles on Grand Avenue, pedestrian movements along or across Grand Avenue should not be a priority to avoid the creation of safety conflicts.	4	1.5	2	1.5	
76. If new grade separations are constructed along Grand Avenue, pedestrian travel across Grand should be considered in the design of the grade separations.	4	4	1		
77. All new street improvements should meet ADA requirements for pedestrian travel.	6.5	0.5	2		
78. Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.	5	1	2	1	
79. Within cities and neighborhoods away from Grand Avenue, local governments should look for ways to enhance pedestrian travel such as reducing length of crosswalks, separating sidewalks from the street curb, and providing shade for walkways.	2.5	5	1.5		
80. Local governments should revise land development standards to enhance pedestrian movements within activity centers.	1.5	5.5	2		
81. Other options from Working Paper #8: **(RPTA)** Consider development of bike/pedestrian tunnels under Grand Avenue **(Glendale)** Provide medians as “safe areas” for pedestrians crossing Grand Avenue	1	1			

Exhibit 10.4 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
Bicycle Improvements					
82. With the emphasis on the movement of motorized vehicles on Grand Avenue, bicycle movements along or across Grand Avenue should not be a priority to avoid the creation of safety conflicts.	5.5	1.5		2	
83. Bicycle movements along Grand Avenue may be accommodated on shoulders or wider outside travel lanes through the share-the-road concept.		4	1		4
84. If new grade separations are constructed along Grand Avenue, bicycle travel across Grand should be considered in the design of the grade separations.	3	4	1		1
85. Encourage the development of the West Valley non-motorized transportation and recreation corridor.	3	2.5	3.5		
86. Local governments should develop specific plans for connecting the residential areas to the regional trail systems being developed such as the West Valley non-motorized transportation and recreation corridor along the New River and Agua Fria River. These connections should not be along Grand Avenue.	4.5	1.5	2	1	
87. Other options from Working Paper #8: **(Unknown)** Keep bikes away **(RPTA)** Study development of multi-use path parallel to Grand Avenue	2				
Electric Cart Improvements					
88. Consider the needs of cart travel in the design of new routes and grade separations.	0.5	2.5	3		3
89. Local governments should conduct a follow-up specific study to develop recommendations for signage, lane markings, and site development standards to accommodate cart needs.	0.5	4	2	1.5	1
90. Retain existing laws that prohibit golf carts on streets with speed limits greater than 35 mph, including Grand Avenue.	7	2			
91. Other options from Working Paper #8: **(Unknown)** Keep carts away					
Longer-Term Potential Grade Separations					
The following potential grade separations or interchanges have merit but need more detailed engineering, cost analyses, and impact assessment. Each one is expected to require the removal of existing businesses and in some cases residential units. Some traffic signals along Grand Avenue that were placed to serve retail centers may have to be removed.					
92. Grade separation interchange at Grand and Bell. This is the busiest intersection and the first priority for a grade separation to relieve congestion.	6	2	1		

Exhibit 10.4 (continued)

	Strongly Support	Somewhat Support	Neutral	Somewhat Not Support	Strongly Not Support
93. Extension of El Mirage Road from Thompson Ranch Road to Olive, with a grade separation interchange at Grand Avenue. This proposed roadway would be part of the city/county road system and local governments should take the lead in implementation.	4	3	2		
94. Meeker/Reems grade separation interchange or emergency access grade separation to Del E. Webb Hospital. This facility would primarily benefit local community travel so local funding participation would be required.	3.5	3.5	2		
95. 103rd Avenue grade separation. This facility would provide a linkage between north and south Sun City for motorized and non-motorized travel. It would almost exclusively benefit local community travel so local funding would be required.	0.5	3.5	5		
96. Other options from Working Paper #8: **(Surprise)** Grade separation at RH Johnson **(Youngtown)** Emergency access only to hospitals **(Unknown)** Review impact on historic and archaeological properties **(PORA)** Emergency access grade separation **ONLY**; do **NOT** support grade separation interchange at Meeker/Reems; use electronic preemption system **(Glendale)** Fully directional connection at 303	3	0.5			
Overall Recommendations (Please give your evaluation of the overall package of improvements presented)	**1**	**5**			

QUESTIONS & ANSWERS FROM NW GRAND MEETING

March 20, 2002, 10:00AM, Surprise City Council Chamber

The following questions and answers were recorded during Dave French's (URS Project Manager) presentations on the recommended options for the Grand Avenue Northwest Corridor:

S. Boggs/RPTA: Do the traffic forecasts reflect 2000 Census data?

D. French/Consultant: We did a special projection of growth in the study area, which is higher than the 1997 MAG projections based on the 1995 census.

Surprise Mayor Shafer: Are the snowbirds included?

D. French: Yes, the MAG forecasts include non-residents.

Comment: Parts of Grand Avenue may now be experiencing some of the volumes forecast for 2010. Therefore our forecasts may be low.

D. French: The forecasts are based on the MAG model, not current counts. In the past, MAG's forecasts of Grand Avenue traffic have been too high.

Q: Did we consider the required capacity to meet peak demand?

D. French: Our forecasts use an April 1st base to coincide with the U.S. Census. Although traffic may be even higher in February and March, in general peak hour traffic is less seasonably variable than ADT. Chris Voigt observed that this study will feed the Northwest Area Transportation Study, which will feed the RTP Phase 2, which will use the new MAG socioeconomic database incorporating 2000 Census data.

Q: What type of facility was assumed for Grand Avenue in the 2025 modeling?

D. French: We assumed a six-lane road without grade separations. Adding a few grade separations doesn't change the forecasts much, but full access control makes a big difference.

Q: The MCDOT Northwest Valley Transportation Study showed a very large population increase, especially in Surprise. Did we take MCDOT's projections into account?

A: Yes, in fact URS worked with the people who prepared the MCDOT study.

Q: Do our forecast increases in Grand Avenue traffic reflect future diversion of traffic to other routes?

A: Yes, we used the MAG model covering the entire region with a full long-range network—e.g., Loop 303 is coded as a four-lane freeway for 2025.

S. Boggs: The upcoming grade separations on Grand southeast of Loop 101 are raising issues regarding operation of the RPTA Yellow Line and possible conflicts with the BNSF right-of-way. Similar concerns could affect transit in our corridor if the roadway is widened.

D. French: This is one reason why we're recommending a de-emphasis of local bus service on Grand. It will be hard to fit in bus stops and also to get pedestrians to the stops. We think the best place for local buses is on other arterials, not a widened Grand.

Q: No new bridge over the Agua Fria River?

D. French: The existing bridge can accommodate six lanes. We're proposing a continuous six-lane section from 101 to 303.

Mayor Shafer: Why can't the drainage ditch along Grand get guardrail like other ditches?

D. French: This is part of what we're proposing.

Q: Can we put the drainage channel in a pipe?

D. French: Theoretically yes—but it's very expensive and not required to build a six-lane section. Guardrail is much cheaper and can be built in the short term.

Mayor Shafer comment: She wants to see a grade separation at Bell Road and an emergency grade-separated railroad crossing serving Del Webb Hospital.

Q: What about extra turn lanes?

D. French: Many intersections will have extra (dual) left-turn lanes and/or right-turn lanes added on Grand Avenue, the intersecting street or both. We have listed these.

Q: Must local governments budget for landscaping?

D. French: Yes, ADOT considers landscaping primarily a local responsibility. Each jurisdiction must work out an IGA with ADOT, but the funding will be primarily or entirely local.

Comment: Youngtown is concerned that commercial frontage up against a six-lane highway may hurt local businesses along Grand, which are the town's only tax base.

D. French: URS will review this issue.

Mayor Shafer: ADOT turned down an offer from Surprise to pay for landscaping along Grand. This route is a major entry to the Valley and needs to look attractive.

D. French: New landscaping must await a decision about how Grand will be widened.

Q: Will the proposed widening occur before 2025?

D. French: The short answer is we don't know—the necessary $30 million is not in the current ADOT program, so nothing is assured.

Chuck Eaton/ADOT: ADOT has insufficient funding to meet all Phoenix-area needs, but tries to distribute the available dollars equitably around the Valley. This study may help projects on this part of Grand make it into the five-year program, which ADOT updates annually. Identification of projects is the first step.

Q: What about light rail along Grand?

D. French: It's a future possibility but will require a great deal of local money.

Q: Would LRT or other transit in unincorporated areas require county funding?

D. French: Yes, the county would have to contribute financially.

S. Boggs: Few arterials other than Grand are available for local bus system expansion into this area. Bell Road is congested and will become more so. Local bus service on Grand will still be needed. Don't reconstruct Grand in such a way as to make a transit retrofit financially prohibitive.

Comment from BNSF: The railroad is studying ways to move its freight yards out of the corridor and divert its daytime operations away from Grand Avenue. This could open an opportunity for light rail or commuter rail in the corridor. BNSF wants a "win-win" situation in which both the railroad and the public will benefit.

D. French: MAG will address these issues in its High Capacity Transit Study currently under way.

Comment from BNSF: The railroad is eager to work with MAG to move toward future commuter rail. Park-and-ride lots in the corridor should be positioned to serve both rail and bus.

Q: Have never heard the railroads propose commuter rail. What could BNSF go for?

A: From the railroad's point of view, the ideal would be to move the Mobest and Glendale yards out of the corridor and out of town. A new western connection to the UP would be built. This would free up the Grand Avenue corridor between 6:00 A.M. and 10:00 P.M. BNSF is thinking in terms of a public/private partnership. On the other hand, BNSF is aggressively marketing to its customers. If the main railroad operation remains in the corridor, freight traffic will only increase.

Comment: We need regional transit on Grand Avenue. Prospects for rail should be part of our study. How would rail reduce the vehicle load on Grand? Look at more than just traffic. Light rail could promote downtown development in cities along the route. Don't fragment lighting,

landscaping and transit among local jurisdictions with inconsistent policies. State that this is only a traffic study that leaves urban design issues untouched.

D. French: Mayor Shafer and others want quick action—we don't want to delay our decisions pending further study of transit options. The communities should get together and decide whether landscaping and lighting should look the same throughout the corridor.

Comment: Change "monitor" to "incorporate" results of MAG High Capacity Transit Study.

D. French: Should we really do this before we know the results of the transit study? URS will look at the wording of this recommendation, however.

G. Snyder (PB): With commuter rail, the additional trains will mess up signal progression worse than it is now.

D. French: This is possible. The negative impacts of commuter rail might outweigh its benefits. A decision on commuter rail won't be made for years. Meanwhile, everyone wants implementable recommendations for the short term, to address the concerns of Mayor Shafer and others.

S. Boggs: What transit assumptions were used in the 2025 modeling?

D. French: We used the MAG 2025 base model. Chris Voigt: MAG gets its transit assumptions from RPTA.

Comment: With high-speed traffic, including many trucks, on a six-lane arterial, the Grand Avenue shoulders won't be very safe for bicyclists.

D. French: We're not recommending designation of Grand as a bike route, but simply recognizing that cyclists will use Grand and need a place to ride.

S. Boggs: Have we considered pedestrian/electric cart tunnels with no automobile access?

D. French: Yes, but any new grade-separated crossing would have substantial costs and impacts to adjacent properties. It's hard to justify these costs and impacts without at least providing emergency vehicle access to the hospitals, as Mayor Shafer and others are demanding.

Comment from Youngtown: Grand Avenue is the lifeblood of the community and its only sales tax base. Don't remove any business frontage, or disturb the intersections at 111th or 113th Avenue.

APPENDIX A

RELATED STUDIES AND PLANS

INTRODUCTION

Grand Avenue has been the subject of many transportation studies over the past 15 years. In 1985, a series of studies was conducted on developing a freeway concept for Grand Avenue to be included as part of the MAG Regional Freeway Plan. Between 1987 and 1989, these plans were reevaluated in additional studies that proposed a viaduct concept for Grand Avenue, but then recommended the freeway concept that was originally developed. Other studies and plans evaluated and designed interim improvements (until a freeway could be constructed) along Grand Avenue and a new bridge across the Agua Fria River.

In 1994, Grand Avenue was removed from the MAG Regional Freeway Plan due to lack of funds for construction. Potential surplus funding sources have renewed interest in upgrading Grand Avenue, and led first to the 1998 MAG Grand Avenue Corridor Study and then to this Grand Avenue Northwest Corridor Study from SR 101L to SR 303L.

The purpose of this working paper on Related Studies and Plans is to provide a general summary of the studies and plans that were reviewed for this study. Studies and plans reviewed include previous Grand Avenue studies, regional multimodal studies, intelligent transportation system plans, and land use plans.*

1.0 PREVIOUS GRAND AVENUE STUDIES

Twenty-nine documents on Grand Avenue were reviewed to obtain background information for this corridor study. The documents include design concept reports, right-of-way inventories, drainage studies, geometric alignment studies, transportation management improvement studies, and corridor studies. A listing of the reviewed documents and a brief summary of each report's contents are provided below.

West Area Transportation Analysis, Parsons Brinckerhoff Quade & Douglas, Inc., June 1985.

The report included an analysis of Grand Avenue and recommended either building a freeway along the corridor or building more grade separations, such as the one completed at Indian School Road by the City of Phoenix in the late 1970s.

Grand Avenue Corridor Study, Final Report (with executive summary), Parsons Brinckerhoff Quade & Douglas, Inc., September 1986.

The report evaluated and analyzed several alternatives for the corridor and recommended replacing Grand Avenue with an access-controlled expressway from Beardsley Canal to I-10. The cost of completing the expressway would be approximately $600 million. The study incorporated material from several companion documents.

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* This material was prepared in 2000. Some more recent updates have been included, but there may have been some other actions taken since then that are not reflected.

Grand Avenue Corridor Study, Environmental Assessment, Parsons Brinckerhoff Quade & Douglas, Inc., July 1986.

The report presented an assessment of the environmental impacts to the study area for each transportation improvement alternative evaluated in the *Grand Avenue Corridor Study*. Significant environmental impacts were identified for both the high level and low level expressway concepts. These impacts include:

- Increase noise levels or vibration for adjoining areas, resulting in exceedance of federal, state or local noise criteria (high level expressway).
- Affect existing housing, requiring the acquisition of residential properties and displacement of people (high level expressway).
- Affect property values or the local tax base (high level expressway).
- Result in the use of publicly-owned land from a park or recreation area (high level expressway).
- Generate additional traffic (high or low level expressway).

The report recommended that a full environmental impact statement be prepared if federal funds are used to construct the expressway. The above impacts may still be applicable, depending on the alignment and design of the facility.

Review of Grand Avenue Corridor Study, Tudor Engineering Company, September 1987.

The report reviewed the *Grand Avenue Corridor Study* and updated the study in accordance with newly expressed goals and policies of ADOT. The report concluded that the recommended high expressway alignment in the *Grand Avenue Corridor Study* did not meet design criteria, nor included the location of major design facilities. The report recommended that half of the expressway should be located southwest of the railroad tracks.

Grand Avenue Freeway Study, Concept Report, Tudor Engineering Company, December 1987.

The report presented a revised expressway concept for Grand Avenue. The concept separated regional through traffic from local traffic on an elevated viaduct. The report also recommended constructing a loop or bypass roadway that would route Grand Avenue traffic around and away from the six-leg intersections, to increase the capacities of the intersections and provide detour routes during construction. Another recommendation was to build one-half of the elevated structure and use three reversible lanes as a staged construction option.

Corridor Volume & Capacity Analysis – Grand Avenue, Tudor Engineering Company, September 1988.

The report summarized the volumes and capacities projected for Grand Avenue in the year 2010, assuming the PBQ&D freeway concept is constructed. Projections were obtained from the MAG

transportation planning model. Daily traffic volumes on Grand Avenue were projected to reach 191,800 vehicles. Level of service analyses were also completed for the mainline and ramps.

Grand Viaduct Concept, Tudor Engineering Company, October 1988.

The report presented a viaduct concept for the Grand Avenue Expressway. The concept consisted of two parallel, three-lane bridge-like structures supported on piers for the length of Grand Avenue and would cost $672 million to construct. The concept separated high speed through traffic from local traffic and maintained access to businesses.

Grand Avenue Viaduct Concept, Drainage Analysis, Tudor Engineering Company, February 1989.

The report recommended a method of providing protection from a 10-year storm for the viaduct concept and the reconstructed at-grade Grand Avenue. The study also provided a method of collecting off-site drainage, anticipated right-of-way requirements and estimated construction costs.

Parsons Brinckerhoff Quade & Douglas Freeway Concept, Right-of-Way Impacts & Cost Analysis, Tudor Engineering Company, February 1989.

The report with accompanying right-of-way plans identified a study level plan for right-of-way acquisition required for the construction of the PBQ&D Freeway Concept. Approximately 885 acres at a cost of $400 million would be needed to construct the freeway.

Grand Freeway, Drainage Analysis, Tudor Engineering Company, May 1989.

The report addressed the drainage requirements for the proposed PBQ&D freeway concept. The report was based on data presented in *the Project Hydrology Report, Volume 1: Existing Conditions*. The report proposed on-site and off-site drainage plans. The estimated construction cost of these plans was $68.6 million. Components of the plans included open channels, detention basins, storm drains, pass-through culverts, pumping stations, and large outfall pipes.

Grand Freeway, Concept Finalization Report, Tudor Engineering Company, August 1989.

The report reviewed and analyzed the high level freeway alignment recommended in the Grand Avenue Corridor Study. The alignment was revised to meet higher design parameters including a design year of 2010 and a design speed of 65 mph. Construction costs were estimated at $775 million.

Grand Freeway, Right-of-Way Acquisition Data, Tudor Engineering Company, August 1989.

The report contained right-of-way data used to support the right-of-way acquisition costs for the Grand Avenue Freeway concept. The report provided a list of properties affected by the proposed right-of-way acquisitions.

Grand Freeway, Right-of-Way Impacts & Cost Analysis, Tudor Engineering Company, August 1989.

Right-of-way impacts associated with the Grand Avenue Freeway concept were documented in the report. A cost analysis and cost estimate were also included in the report. The Grand Avenue Freeway concept would require right-of-way acquisition of 854 acres at a cost of $403 million.

Existing Right-of-Way Inventory Data, Tudor Engineering Company, August 1989.

The document includes an inventory of individual land parcels along Grand Avenue that are potentially affected by one or more of the alternatives for Grand Avenue. The inventory was incorporated into the TRANSPORT1 system and contained background information that could then be applied during right-of-way acquisition of the preferred alternative.

Grand Avenue, Existing Utility Summary, Tudor Engineering Company, August 1989.

The report provided an inventory of all utilities found within the Grand Avenue Corridor. The inventory listed the size, location, and ownership of each utility in the corridor. A mapping of the utility locations was presented in a separate appendix.

Railroad Relocation Evaluation of the Grand Avenue Corridor, Parsons Brinckerhoff Quade & Douglas, Inc., February 1988.

The study evaluated four major alternatives for relocating the railroad tracks running parallel to Grand Avenue. The recommended alignment is along the Dysart/El Mirage alignment. The realignment would remove 28 at-grade railroad crossings in the Grand Avenue Corridor. However, it would cost $43 million more than would be saved in constructing the expressway due to the relocation of the railroad.

Grand Avenue Transportation System Management Study, Proposed Interim Improvements (with executive summary and appendices), Tudor Engineering Company, February 1989.

The report identified, evaluated, and recommended low-cost transportation system management improvements for Grand Avenue. Capacity improvements such as lane additions, movement restrictions, and traffic signal phasing changes were examined at each of the five- or six-legged intersections. Ten projects at a cost of $5.7 million were recommended. Projects included standardization of intersection signage and layout, installing a signal master system and coordinating the signals on Grand Avenue, modification of left turns, and improving intersection geometry including improving turn radii. The appendices were bound in a separate report. These appendices contain a discussion on *Highway Capacity Manual* signalized intersection analysis, traffic counts taken at each intersection on Grand Avenue, and accident collision diagrams for each intersection.

Grand Avenue Task Force For Transportation System Management Improvements Project Manual and Meeting Minutes, Tudor Engineering Company.

The report is a collection of meeting notes from the Grand Avenue Task Force for Transportation System Management Improvements. Base information for the corridor is also included.

Grand Avenue Traffic Projection, Final Report (with appendices), Howard Needles Tannen & Bergendoff, June 1989.

The report produced a consistent set of 2010 traffic projections for four Grand Avenue design concepts. These design concepts were: arterial (no build), expressway, freeway and viaduct. The projections were obtained from the MAG regional urban travel demand models. The appendices contain traffic counts, technical memoranda, highway capacity analyses and traffic projections.

Agua Fria River Bridge, Alignment Study Report, Michael Baker Jr., Inc., June 1989.

The report analyzed three alignment alternatives for the Agua Fria River Bridge. These included the present design alignment, an alignment 28 feet north of the existing Grand Avenue centerline, and an alignment 18 feet south of the existing centerline. The recommended alternative is the alignment 28 feet north of the existing centerline. It was projected to cost $8.3 million. A September 1989 addendum modified the recommended alternative. The modified alternative was 18 feet north of the existing Grand Avenue centerline and its estimated cost was $7.8 million. The modified alternative provided ADOT with additional options for CalMat access, the railroad tracks, and drainage.

Thunderbird at Grand Avenue, Level of Service Analysis, Kimley-Horn & Associates, Inc., January 1990.

The report assessed the feasibility of a three-lane cross-section instead of a five-lane section for Thunderbird Road south of Grand Avenue. The report stated that a three-lane section for the northbound Thunderbird Road approach at Grand Avenue would be adequate, as the v/c ratio did not approach 1.0 in either peak hour using 2000 projected volumes.

Grand Avenue Widening, Beardsley Canal to Thunderbird Road, Cost Estimate and Calculations for Horizontal and Vertical Alignment, Kimley-Horn & Associates, Inc., January 1990.

The report provided a collection of the calculations used in estimating the cost to widen Grand Avenue between Beardsley Canal and Thunderbird Road. The total estimated cost was $20 million.

Agua Fria River Bridge, Design Concept Report, Draft, Michael Baker Jr., Inc., March 1990.

The report re-evaluated the basic concept and design of the proposed Agua Fria River Bridge project because of an existing sanitary landfill and reduced design flows for the river. The report recommended realigning the bridge to maximize use of existing right-of-way, lower the main

channel bridge and eliminate the overflow channel bridge. The bridge would likely need to be widened to three lanes in each direction, ten years after construction.

Agua Fria River Bridge Drainage Alternative Concepts and Recommendation, Michael Baker Jr., Inc., May 1991.

The report evaluated various drainage alternative concepts for drainage of Grand Avenue between Thunderbird Road and the Agua Fria River. The recommended alternative includes proving a double pipe storm sewer to convey drainage into the river. Off-site flows would flow across Grand Avenue via a small bridge or box culvert. The project was estimated to cost $1.1 million.

Agua Fria River Bridge, Final Drainage Report, Michael Baker Jr., Inc., November 1991.

The report provided the hydrology and drainage concept for approximately one mile of associated roadway improvements to Grand Avenue. The report also defined assumptions and design conditions for the bridge related to drainage.

Agua Fria River Bridge, Final Design Analysis, Bruflat Engineering Company, August 1992.

The report proposed an alternative to the drainage concept of the Agua Fria River Bridge. The alternative included using precast concrete box culverts in place of 2-72" reinforced concrete pipes.

Final Design Concept Report, US 60, Morristown Railroad Overpass-Beardsley Road, Sverdrup Civil Inc. (for ADOT), June 1996.

This Final Location/Design Concept Report presents the results of an investigation of alternatives for improving US 60 between Morristown and Beardsley Road, just southeast of the SR 303L intersection. The preferred alternative for this 15.4-mile segment of two-lane rural highway is a four-lane divided highway with a 60-foot median, using the existing roadway for westbound traffic.

Grand Avenue Corridor Study, Beardsley Canal to 7th Avenue/Van Buren, URS Greiner, May 1998.

This corridor study provided an examination of 14 options for the corridor and the further development and refinement of three of those options. Integration of transit into the corridor and the impact on development along the corridor were parts of the process. The results of the study indicated that there is considerable interest in pursuing major improvements to the Grand Avenue Corridor. There was no consensus on the best option for the corridor, however.

Specific options considered in the study included:

- A depressed expressway through Sun City, with frontage roads and ramps connecting to major cross streets.

- Grade separation for pedestrians and golf carts in Sun City.
- Improved lane continuity, signal timing and signal progression between the New and Agua Fria rivers.
- Diversion of traffic west of Sun City to SR 303L, Dysart Road, or a possible new north-south route from Bell Road to Olive Avenue near the Agua Fria River.

Grand Avenue Major Investment Study, URS Greiner Woodward Clyde, September 1999.

This ADOT-sponsored MIS developed and evaluated alternatives for solving transportation problems in the Grand Avenue Corridor from I-17 to SR 101L, with an emphasis on alleviating traffic congestion due to the six-leg intersections and Burlington Northern Santa Fe (BNSF) railroad activity. After careful consideration of factors such as existing infrastructure, current traffic conditions, traffic forecasts, socioeconomic characteristics, land uses and environmental concerns, the study concluded that the alternative known as Option 4 should be implemented as quickly as available funding permits. Option 4 eliminates the major six-leg intersections by constructing alternating grade separations; i.e., Grand Avenue is grade-separated at some intersections and one of the cross streets is separated at others. In addition, a new southbound off-ramp and northbound on-ramp will connect Grand with SR 101L via 91st Avenue.

ADOT and MAG have programmed $176.6 million to implement the recommended improvements by 2007. Between the eight grade-separated intersections (including the existing Indian School overpass), a limited number of signalized intersections will remain. However, the recommended improvements will allow Grand Avenue to be further upgraded to expressway standards by elimination of access and construction of additional grade separations, as specified in the MAG Long Range Transportation Plan.

2.0 MULTIMODAL STUDIES AND PROGRAMS

Thirty-five multimodal and intelligent transportation system documents pertaining to Grand Avenue were reviewed as part of the Grand Avenue MIS. A brief summary of each report follows.

In addition to the reports reviewed below, many federal and state regulations, policies and standards affect transportation planning and project development throughout Arizona. Updates of important federal planning, environmental and ITS (Intelligent Transportation Systems) regulations are pending as of November 2000. ADOT policies on issues such as noise and emissions control during construction affect all major projects on state highways, including Grand Avenue. The ADOT noise policy was updated during 2000.

Arizona Rail Passenger Feasibility Study Final Report, Kimley-Horn & Associates, Inc., November 1993.

This study concluded that new rail passenger service is feasible in a limited number of Arizona locations, including two involving the Grand Avenue Corridor: a Glendale-Mesa commuter rail

line and a Phoenix-Grand Canyon tourist rail line. Both would use the existing BNSF rail corridor along Grand Avenue between I-17 and SR 101L.

Arizona Rail Passenger Feasibility Continuation Study Project Planning, Kimley-Horn & Associates, Inc., June 1994.

This study documented the detailed project planning of key recommendations resulting from the *Arizona Rail Passenger Feasibility Study*. These recommendations included further consideration of a 33-mile commuter rail corridor between 82nd Avenue/Peoria Avenue in Peoria and Baseline Road in Mesa, of which roughly 12 miles are along Grand Avenue. The study developed capital and operating cost estimates, revenue projections, and potential locations for route termini and other stations. Grand Avenue northwest of Downtown Peoria was not among the corridors recommended for further consideration, primarily because of low ridership projections for commuter service in the Sun Cities area.

FY 1994 State Rail Plan Update Final Report, Parsons Brinckerhoff Quade & Douglas (for ADOT), June 1994.

This update to the Arizona State Rail Plan provides information on the systems, projects and activities of Arizona's passenger and freight railroads, including the Class 1 BNSF (at that time, AT&SF) route within the Grand Avenue Corridor.

High Occupancy Vehicle Facilities Policy Guidelines and Plan for the MAG Freeway System, Final Report & Executive Summary, Lima & Associates and JHK & Associates, September 1994.

The HOV Policy Guidelines and Plan for the MAG region was a joint undertaking of ADOT, MAG and the Regional Public Transportation Authority (RPTA). A park-and-ride lot was proposed for Grand Avenue (at that time still designated as the future Grand Expressway) near El Mirage Road. No HOV lanes were recommended northwest of SR 101L, however.

Draft Fiscal Year 1995 MAG Transportation Management Systems Report, MAG, November 1994.

This is a progress report on the development and application of six regional management systems: Congestion, Intermodal, Pavement, Safety, Bridge and Public Transportation. The report identifies several problem areas within the Grand Avenue Corridor, including eight intersections projected to experience serious congestion by 2015. Specific findings included:

- Eight intersections in the study corridor, including four in Sun City and three in Surprise, will be seriously congested by 2015.
- Dysart Road from Grand Avenue to Greenway Road, plus two local street segments in Youngtown, have pavement with poor ratings.
- One bridge on Grand Avenue west of Litchfield Road fails to meet applicable design standards.

Arizona State Transportation Plan, ADOT, December 1994.

This multimodal transportation plan classifies Grand Avenue within the study corridor as a Principal Arterial—Other. As US 60, Grand Avenue is on the National Highway System and has been designated as a National Intercity Truck Route. Grand Avenue is also part of a "Transportation Corridor of Statewide Significance."

1993 Study of Travel Speed and Delay in the MAG Region, Lee Engineering, March 1995.

The study documents the collection and analysis of travel speed data within the MAG region. The report also presents intersection stopped delay data at signalized intersections. Data on travel speeds for Grand Avenue and HOV facilities are included in the report.

MAG Intermodal Management System, April 1995.

This document identifies intermodal transportation facilities in the MAG region, identifies deficiencies and lists potential projects. Intermodal facilities in the Grand Avenue Corridor include the BNSF's El Mirage Auto Distribution Facility and the Greyhound stop in Youngtown. Grand Avenue, SR 101L and SR 303L serve as intermodal access routes for the region. No problems were identified at the El Mirage Auto Distribution Facility, but the report noted that Grand Avenue has inadequate pavement and that the Grand/R.H. Johnson intersection is congested.

MAG Pedestrian Area Policies and Design Guidelines, Logan Simpson & Dye, October 1995.

These policies and guidelines are intended to promote a safe and comfortable environment for pedestrians at the neighborhood, community, district and campus levels. Many examples are illustrated for different types of land uses and activity areas.

Express Bus Study Background Report, City of Phoenix and Regional Public Transportation Authority, September 1996.

This report provides information on regional express bus services, ridership patterns, user attitudes and related issues as background for development of a regional express bus system plan.

Bikeways in the Metropolitan Phoenix Area, MAG, 1997.

This regional map illustrates regional bikeway facilities including multi-use paths (paved and unpaved), bicycle lanes, signed bicycle routes and edge stripes. A revised version is expected to be ready by early 2001. Bike lanes exist on El Mirage Road from Santa Fe Lane to Thunderbird Road, and there is a paved multi-use path along 111th Avenue from Grand Avenue to Peoria Avenue.

Rural Maricopa County Transit Development Program, TransitPlus, Inc., February 1997.

This study, prepared for the Maricopa County Department of Transportation (MCDOT), considered alternatives for improving public transportation in rural Maricopa County within available resource constraints. Recommended improvements include a route-deviation service between Wickenburg and the metro area operating two to three times per week, and expansion of fixed-route and route-deviation services in the Sun Cities.

Maricopa County 2020 Eye to the Future Transportation System Plan, December 1997.

MCDOT is responsible for public roads through unincorporated areas of the county. Elements of their fiscally unconstrained plan include policies, roadways, transit, non-motorized modes and Intelligent Transportation Systems (ITS). The ITS chapter describes the AZTech Model Deployment Initiative which the MAG Regional Council adopted in 1996. The AZTech Initiative designated Grand Avenue from Van Buren Street to Bell Road as one of the eight original "SMART Corridors" for enhanced traffic detection, data collection, and signal control. (See also the discussion below of the more comprehensive MAG ITS Strategic Plan updated recently.)

The Transportation System Plan shows all of Grand Avenue as a "primary road" serving regional travel. As defined by MCDOT, criteria for inclusion in the unofficial primary roadway system include regional emphasis, system requirements (upgradability, connectivity, continuity, principal routes to freeway system), access to activity centers and scenic/recreational significance. The Transportation System Plan also shows Grand Avenue with an "on-road bikeway overlay," a "potential bus routes overlay" southeast of Meeker Boulevard, and an "ITS SMART Corridors overlay" southeast of Bell Road. Several other roads in Sun City and Sun City West are potential routes for local circulator buses.

The other County-designated primary roads in the study area are SR 303L, Bell Road and Dysart Road from Bell Road south. Bell Road has a bikeway overlay, a SMART Corridors overlay east of Grand and a potential bus route overlay east of Litchfield Road.

Estrella Corridor Study MC 85 to Interstate 17, DeLeuw Cather & Company, March 1998.

This study, conducted for MCDOT, evaluated alternatives for the preservation and future development of the 37-mile Estrella (SR 303L) Corridor. These alternatives relate specifically to the routing of the highway from Lake Pleasant Road to I-17. Between MC 85 and Lake Pleasant Road, a six-lane, at-grade expressway with a 65 mph design speed is proposed as the ultimate facility. This study was not approved or adopted by the MAG Regional Council.

Grand Avenue Corridor Study, URS Greiner, May 1998.

This study (see Section 1.0 above) considered a wide range of improvement options for Grand Avenue from 7th Avenue to Cotton Lane, and recommended three alternatives for further evaluation. It briefly examined ways in which light rail and express bus transit could be integrated with proposed highway improvements in the corridor.

Bicycle Transportation System Plan, MCDOT, January 1999 (Final Draft).

This plan for the unincorporated areas of Maricopa County contains a list of over 100 recommended bikeways, including three (two in Sun City and one in the SR 303L corridor) that lie partially within the Grand Avenue Corridor. Specifically, on-street bikeways are recommended for SR 303L from Grand to 107th Avenue, 99th Avenue from Olive Avenue to Bell Road, and 103rd Avenue from Grand to Boswell Boulevard.

MAG Regional Bicycle Plan, revised January 1999.

The MAG Regional Bicycle Plan sets bicycle planning objectives and recommends a regional bikeway system. The plan calls for on-road bikeways along Grand Avenue, Bell Road, 99th Avenue and Litchfield Road south of Bell. Off-road bikeways in the New and Agua Fria river corridors are also proposed.

MCDOT Accomplishments and Five-Year Transportation Improvements Program for Fiscal Years 2000-2004, June 1999.

This document serves as the MCDOT's five-year roadway construction program. Two of the programmed projects lie within the Grand Avenue study corridor. These are construction of the SR 303L/Grand Avenue interchange, and extension of SR 303L from Grand Avenue to Lake Pleasant Road.

Long Range Transit Plan, Regional Public Transportation Authority, June 1999.

This document provides long-range planning guidelines for fixed guideway, local bus, express bus, neighborhood circulator and paratransit services. The plan calls for an overall tripling of transit service in the greater Phoenix area, with buses operating 19 hours per day on weekdays and 14 hours on weekends. Buses would run at least every 30 minutes throughout the day on all major streets, with additional service during peak hours. Paratransit (dial-a-ride) would be improved to an equivalent level. There are currently no funding sources to implement these services in the northwest Valley or the Grand Avenue Corridor, however. (See below under "Short Range Transit Report" for specific transit services proposed for short-term implementation in the corridor.)

Grand Avenue Major Investment Study, URS Greiner Woodward Clyde, September 1999.

In addition to developing a recommended alternative for major roadway improvements, the MIS addressed the implications of these improvements for transit, bicycles and pedestrians. Among the concepts considered were bike paths within the right-of-way, high-frequency express bus service, reserved HOV/bus lanes, and extension of a future light rail line from Downtown Glendale to Downtown Peoria via the Grand Avenue Corridor. Light rail was found to be a feasible concept for further study, while HOV lanes were rejected because of inefficiency and operational concerns. (See also Section 1.0.)

MAG Pedestrian Plan 2000, The Planning Center and SCI, December 1999.

This document provides a review of existing conditions, goals and objectives, analysis of potential pedestrian trip activity using the latent demand model, roadside facility performance guidelines (design criteria) and an action plan for the MAG region. Several areas of pedestrian demand or potential activity were identified in Sun City, Sun City West, Youngtown and El Mirage.

MCDOT Northwest Valley Transportation Study, BRW, Inc., June 2000.

The Northwest Valley Transportation Study includes the entire Grand Avenue study corridor. The study developed a long-range transportation plan for all modes, including transit, bicycles and pedestrians. Official MAG networks and socioeconomic data were used to forecast traffic for the years 2003 and 2010. MCDOT developed two sets of traffic forecasts for 2020. The first was based on the MAG model inputs, while a "sensitivity" analysis incorporated additional growth expected by the cities of Peoria and Surprise. Recommendations of the study included several future capacity increases on various segments of Grand to meet forecasted demand, plus expanded transit service in the corridor. This study has not been adopted as part of the MAG Long Range Transportation Plan.

Specific recommendations of the Northwest Valley Transportation Study include:

- By 2003, widen Grand to eight lanes from 91st to 99th Ave, and to six lanes from 107th to Greenway.
- By 2010, widen Grand to eight lanes from 99th to Thunderbird, and to 6 lanes from Greenway to SR 303L.
- By 2020 (under the MAG development scenario), widen Grand to eight lanes from Thunderbird to Greenway.
- By 2020 (under the sensitivity scenario), widen Grand to eight lanes from Greenway to SR 303L.
- Extend bus service on Grand to Bell Rd by 2003 and to Meeker Blvd by 2008.

5-Year Highway Construction Program FY 2001-2005, ADOT, June 2000.

This annually updated document lists all projects scheduled for construction on the Arizona state highway system.

MAG Long-Range Transportation Plan Summary and 2000 Update, July 2000.

This document summarizes the long-range, multimodal transportation plan for the MAG region. The plan's horizon year is 2020. The freeway/expressway element states that "a corridor study to identify ultimate and near term concepts for the portion of Grand Avenue between the Agua Fria Freeway and the Beardsley Canal is under way." In addition, the Plan calls for the portion of Grand between SR 101L and I-17 to be upgraded to expressway standards by elimination of

access and construction of additional grade separations, beyond those recommended for short-term construction in the 1999 Major Investment Study. The Express Bus Plan map shows a future express bus route on Grand Avenue from SR 101L to Bell Road, with park-and-ride lots at Bell Road and at SR 101L.

Short Range Transit Report Fiscal Year 2000 through 2004, Valley Metro, no date.

The Short Range Transit Report summarizes existing transit facilities and operations. It also documents planned capital and operating improvements to the regional transit system for a five-year period. Listed projects affecting the Grand Avenue Corridor include the purchase of capital equipment and facilities, as well as several planned but unfunded transit service improvements. Programmed capital projects include RPTA's purchase of 14 replacement buses and one bus to expand service for Sun Cities Area Transit, as well as the design and/or construction of five regional park-and-ride lots throughout the Phoenix metropolitan area. Planned (but currently unfunded) operating improvements consist of new fixed-route bus service on Dysart Road, extension of the existing Thunderbird Road route west to Boswell Hospital, extension of the Bell Road route west to Dysart Road, and a "Wickenburg Connector" offering deviated fixed-route service between Wickenburg and key destinations in the greater Phoenix area.

Transportation Improvement Program FY 2001-2005, MAG, July 2000.

This multimodal five-year program provides information on all programmed transportation projects throughout the MAG region, including state, county and local improvements to roadway and transit systems.

Bus Book, Valley Metro, August 2000.

The Bus Book includes route maps and schedules for all local and express bus routes in the greater Phoenix area.

Regional Dial-a-Ride Guide, Valley Metro, no date.

This publication provides information on the Valley's 10 Dial-a-Ride services, including Sun Cities Area Transit and the El Mirage and Surprise Dial-a-Rides.

"Trails Master Plan," City of Peoria, no date.

This document is a map illustrating planned on-street bike routes, paved multi-use paths, unpaved multi-use trails and equestrian trails in Peoria.

MAG ITS Strategic Plan Update, Kimley-Horn & Associates.

MAG produced a detailed plan for deploying Intelligent Transportation System (ITS) projects and programs throughout the region over the next 20 years. This Plan revises the original ITS Strategic Plan completed in 1995 as part of the AZTech Model Deployment Initiative. Key elements identified or developed in the MAG Plan include:

- ITS solutions to be deployed over the next 20 years to meet regional transportation needs.
- A System Architecture to show how all of the systems, subsystems and field elements work together.
- A Telecommunications Plan to support the candidate technologies (many of which are already in place on key freeways and arterial roadways).
- An Implementation Plan for short-, medium- and long-range ITS deployment.
- Operational and Implementation Strategies to outline agency roles, responsibilities and resources needed to support long-term ITS operations.

Grand Avenue from Van Buren Street to Bell Road was previously identified in the AZTech Model Deployment Initiative as one of 24 regional SMART corridors. These corridors are key arterial links that pass through multiple jurisdictions. ITS technologies to be implemented in SMART corridors include traffic detection, closed circuit television cameras and variable message signs. Traffic signals are coordinated across jurisdictional boundaries and freeway interchange signals are coordinated with arterial street signal systems. Grand Avenue between SR 101L and Bell Road, as well as the portion southeast of the study area, is a Phase I corridor, meaning that ITS implementation has begun. Bell Road to the east of Grand Avenue is also a Phase I ITS corridor.

The following planned projects are likely to affect the study corridor:

- Install Freeway Management System (FMS) components on SR 101L, Grand Avenue to I-17 (mid-term project, 2007-2011).
- Upgrade components on existing SMART corridors and add additional components as needed (long-term project, 2012-2021).
- Improve signal coordination along SMART corridors (long-term project, 2012-2021).

MAG Park-and-Ride Lot Site Selection, KJS Associates.

In January of 2000, MAG initiated a study to identify sites for 20 new park-and-ride lots across the region to support express bus service as well as car and vanpools using the regional freeway system. The study was completed and approved by the MAG Regional Council in January of 2001. More than $40 million have been programmed for the land acquisition, design and construction of new park-and-ride lots in the first five years of implementation of the MAG Park-and-Ride Plan. One of the lots specified in the MAG Park-and-Ride Plan is located at Bell and Dysart and falls within the Grand Avenue Northwest study area.

MAG-ADOT CANAMEX Corridor Study.

In late 1999, MAG initiated a study to review alternatives and make a recommendation for the routing of the CANAMEX Corridor through the MAG region. The study was conducted in two phases, with the final segment of the corridor selected in Phase II. The recommendation for the designation of the corridor was approved in April 2001 by the MAG Regional Council and was

incorporated into the MAG Long Range Transportation Plan as a study corridor. The general alignment of the corridor will be as follows: I-8 between I-10 and SR 85; SR 85 between I-8 and I-10; I-10 from SR 85 to a Wickenburg Road connection; an alignment in the general vicinity of Wickenburg Road and Vulture Mine Road that connects to the future US 93/US 60 Wickenburg Bypass, the specific alignment of which is to be determined following the completion of needed studies by ADOT; and the future US 93/US 60 Wickenburg Bypass from its junction with Vulture Mine Road to US 93. The Wickenburg Road/Vulture Mine Road alignment shall not become eligible as a state route unless and until its design, right-of-way acquisition, construction, and operation have been fully funded. The Sun Valley Parkway and Eagle Eye Road were eliminated from further consideration for designation as part of the CANAMEX Corridor through Maricopa County as part of the same Regional Council action.

Grand Avenue Image Improvement Study, Todd and Associates (for City of Glendale).

This study identified ways to improve the attractiveness and overall image of the five-mile segment of Grand Avenue in the city of Glendale, from 43rd to 71st Avenue. Examples of proposed enhancements include landscaping and bus stop treatments. The report was completed in May 2001.

Pedestrian-Oriented Development Guidelines, Regional Public Transportation Authority, in progress.

Based on the principles of transit-oriented development, but with a broader focus on the pedestrian, these guidelines are being prepared by the RPTA to provide planners and developers with tools for more pedestrian-oriented development. Currently in draft form, these guidelines will be the subject of a design competition to be sponsored later this year by Valley Forward. The competition will draw on the talents of local designers and developers to demonstrate the application of pedestrian principles in the desert environment. Valley Forward will work with participating cities to promote the approval of future plans that are in keeping with the spirit of the winning entries.

Regional Transportation Plan, MAG, in progress.

This project will develop a comprehensive, multimodal regional transportation plan through the year 2025, in two phases. The first phase began toward the end of 2000 and will be completed in early 2003. It includes issue papers, expert panel forums, a Status of Regional Transportation Report, development of alternative growth concepts, analysis of growth alternatives, and transportation principles. These activities will lay the groundwork for the second phase, preparation of the detailed long-range transportation plan.

3.0 LAND USE AND COMMUNITY PLANS

The planning and economic development departments of the Cities of Peoria, El Mirage and Surprise were contacted to obtain documents presenting land use and socio-economic conditions within the Grand Avenue corridor. (Youngtown has only a map of current zoning.) The

following land use and community plans were reviewed and documented for the Grand Avenue Northwest Corridor Study.

El Mirage General Plan, 1986.

This document is now nearly 15 years old and is considered obsolete by El Mirage city staff. An updated version is expected in the near future.

Phoenix Area Economic Base Study: Maricopa County, AZ, Data Report, December 1996.

The study provided general statistical information for the municipalities within Maricopa County. This information was presented in the form of industry sector summaries and area-wide demographic/economic data.

Peoria Comprehensive Master Plan (Volume II), April 1997.

The Master Plan identified general land use for the Grand Avenue corridor within the city boundaries. The Comprehensive Master Plan displayed the land use adjacent to Grand Avenue as primarily industrial, business park and community commercial. Land use in the downtown area, immediately adjacent to Grand Avenue, is primarily high-intensity community commercial. A major update of the Comprehensive Master Plan is currently under way.

Peoria Downtown Redevelopment Plan, Design Workshop, 1999.

The Plan defines redevelopment and economic development initiatives and strategies for the downtown area, with emphasis on preserving the existing commercial inventory and establishing community identity and promoting a pedestrian oriented environment.

Surprise General Plan 2020, Partners for Strategic Action, September 2000 (Public Hearing Review Draft, with recommended changes from City Council and Planning & Zoning Commission).

Transportation-related recommendations for the Grand Avenue study area include the following:

- SR 303L (south of Grand) is proposed as a four- to six-lane parkway emphasizing landscaping, meandering sidewalks and a regional bikeway connection.
- Grand Avenue is shown as a principal arterial, with a pedestrian overpass recommended in the vicinity of Sunny Lane.
- Transit routes are recommended for Grand Avenue (from Jomax Road to El Mirage) and several intersecting roads such as Greenway, Dysart, Bell, Reems and SR 303L. Proposed park-and-ride locations include Bell Road between El Mirage and Dysart, Bell Road between Litchfield and Bullard, and Grand Avenue just northwest of SR 303L.
- Proposed bicycle and multimodal routes include a multi-use path parallel to Grand Avenue, as well as bike lanes on Greenway, Dysart, Reems and Mountain View Boulevard. The Agua Fria River is a proposed West Valley Recreation Corridor.

- "Upon completion of the Grand Avenue expansion, access to the facility should be minimized. The portions of Grand Avenue that have not been developed should be encouraged to maintain a one-mile spacing of all access points." The same one-mile spacing is recommended for access to SR 303L.

4.0 CULTURAL RESOURCE DOCUMENTS

In conjunction with the 1999 Grand Avenue MIS, a literature search at the State Historic Preservation Office Library was performed to obtain documents on cultural resources. Two documents that pertain to Grand Avenue from SR 101L to SR 303L were found. Brief reviews of these documents are provided below, along with references to other sources of information on historically significant sites.

Grand Avenue Corridor Study, Cultural Resource Survey, Janus Associates, Inc., June 1986.

The survey resulted in the identification and evaluation of 49 historic properties of varying eligibility on the National Register. The report also provided a historic account of the development of Grand Avenue.

Grand Avenue Alignment Historic Building Survey, Woodward Architects, February 1993.

The survey identified 116 buildings built prior to 1942. The report provided an inventory and index map for each of the properties.

National Register of Historic Places.

The National Register of Historic Places was established by the National Historic Preservation Act of 1966, as amended in 1980. It is the nation's official listing of prehistoric and historic properties worthy of preservation. It affords recognition and protection for districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering and culture. The Register serves as a planning tool and as a means of identifying sites and districts that are of special significance to a community and worthy of preservation. A review of the National Register Information System found no listings within the Grand Avenue Northwest Corridor.

Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Collections.

The HABS and HAER are collections of documentary measured drawings, photographs, and written historical and architectural information for over 31,000 structures and sites in the United States. The U.S. Department of the Interior administers the surveys and creates the records, which are transferred to the Library of Congress. Architectural and engineering structures and sites of almost every type, including residential, commercial, public, religious, military, and industrial categories, have been recorded in these collections. A review of the on-line geographic index found no listings within the Grand Avenue Northwest Corridor.

5.0 SUMMARY

Table 1 summarizes relevant conclusions and recommendations from the more recent studies and plans listed in preceding sections. Not all of these documents are included in the table, since not all contain specific findings or recommendations regarding Grand Avenue from SR 101L to SR 303L.

Table 1
Relevant Conclusions and Recommendations from Recent Studies

Study or Plan	Conclusions and Recommendations
Arizona Rail Passenger Feasibility Continuation Study (1994)	Grand Avenue northwest of Downtown Peoria was not among the corridors recommended for further consideration, primarily because of low ridership projections for commuter service in the Sun Cities area.
HOV Facilities Policy Guidelines & Plan (1994)	Develop a park-and-ride lot near Grand/El Mirage Road.
Draft MAG Transportation Systems Management Report (1994)	▪ Eight intersections, including four in Sun City and three in Surprise, will be seriously congested by 2015. ▪ Dysart from Grand to Greenway and two local street segments in Youngtown have pavement with poor ratings. ▪ One bridge on Grand west of Litchfield is substandard.
MAG Intermodal Management System (1995)	▪ Grand Avenue has inadequate pavement. ▪ The Grand/R.H. Johnson intersection is congested. ▪ No problems noted at El Mirage Auto Distribution Facility.
US 60 Final DCR, Morristown-Beardsley Rd (1996)	Construct four-lane divided highway with a 60-foot median, using existing roadway for westbound traffic.
Bikeways in the Metropolitan Phoenix Area	There are bike lanes on El Mirage Road from Santa Fe Lane to Thunderbird, and a paved multi-use path along 111th Avenue from Grand to Peoria.
Rural Maricopa County Transit Development Program (1997)	▪ Expand fixed-route and route-deviation services in the Sun Cities. ▪ Implement a twice- or thrice-weekly route-deviation service between Wickenburg and the metro area.

Study or Plan	Conclusions and Recommendations
Maricopa County 2020 Eye to the Future Transportation System Plan (1997)*	▪ Grand Avenue is on the County's designated Primary Roadway System. ▪ Southeast of Meeker Boulevard, Grand is a potential bus route. ▪ Several other roads in Sun City and Sun City West are potential routes for local circulator buses. ▪ Southeast of Bell Road, Grand is designated as an ITS Smart Corridor.
Grand Avenue Corridor Study (1998)	▪ Improvement options include: ▪ Depressed expressway through Sun City, with frontage roads & ramps connecting to major cross streets. ▪ Grade separation for pedestrians & golf carts in Sun City. ▪ Improved lane continuity, signal timing & progression between New & Agua Fria rivers. ▪ Diversion of traffic west of Sun City to SR 303L, Dysart Road, or a possible new north-south route from Bell to Olive near the Agua Fria River.
MCDOT Bicycle Transportation System Plan (1999)	Bikeways are recommended for SR 303L from Grand to 107th Avenue, 99th Avenue from Olive to Bell, and 103rd Avenue from Grand to Boswell Boulevard.
MAG Regional Bicycle Plan (1999)	The plan calls for on-road bikeways along Grand Avenue, Bell Road, 99th Avenue and Litchfield Road (south of Bell). Off-road bikeways in the New and Agua Fria river corridors are also proposed.
MAG Long-Range Transportation Plan Summary & Update (2000)	A future express bus route is shown on Grand from SR 101L to Bell, with park-and-ride lots at Bell and SR 101L.
Short Range Transit Report	Chapter 3 provides a list of planned projects.
MCDOT Five-Year Transportation Improvement Program (1999)	Two projects in the study corridor are listed: construction of the SR 303L/Grand interchange, and extension of SR 303L from Grand to Lake Pleasant Road.
MAG Transportation Improvement Program (2000)	Chapter 3 provides a list of planned projects.
Grand Avenue Major Investment Study (1999)	Complete the SR 101L interchange by constructing a southbound off-ramp and a northbound on-ramp connecting with 91st Avenue.

* This study was not adopted by MAG.

Study or Plan	Conclusions and Recommendations
Northwest Valley Transportation Study (2000)*	▪ By 2003, widen Grand to eight lanes from 91st to 99th Avenue, and to six lanes from 107th to Greenway. ▪ By 2010, widen Grand to eight lanes from 99th to Thunderbird, and to six lanes from Greenway to SR 303L. ▪ By 2020 (under the MAG development scenario), widen Grand to eight lanes from Thunderbird to Greenway. ▪ By 2020 (under the sensitivity scenario), widen Grand to eight lanes from Greenway to SR 303L. ▪ Extend bus service on Grand to Bell Rd by 2003 and to Meeker Boulevard by 2008.
ADOT *5-Year Construction Program* (2000)	Chapter 3 provides a list of planned projects.
Surprise General Plan 2020 (2000)	▪ Grand Avenue is shown as a principal arterial, with a pedestrian overpass recommended in the vicinity of Sunny Lane. ▪ Transit routes are recommended for Grand Avenue (from Jomax Road to El Mirage) and several intersecting roads such as Greenway, Dysart, Bell, Reems and SR 303L. Proposed park-and-ride locations include Bell Road between El Mirage and Dysart, Bell Road between Litchfield and Bullard, and Grand Avenue just northwest of SR 303L. ▪ Proposed bicycle and multimodal routes include a multi-use path parallel to Grand Avenue, as well as bike lanes on Greenway, Dysart, Reems and Mountain View Boulevard. The Agua Fria River is a proposed West Valley Recreation Corridor. ▪ "Upon completion of the Grand Avenue expansion, access to the facility should be minimized. The portions of Grand Avenue that have not been developed should be encouraged to maintain a one-mile spacing of all access points."
MAG Park-&-Ride Site Selection	A park-and-ride lot was recommended near Bell and Dysart roads.
CANAMEX Corridor Study	The Wickenburg Road/Vulture Mine corridor was designated as the CANAMEX corridor to connect from the US 60/US 93 planned Wickenburg Bypass to I-10.

* This study was not adopted by MAG.